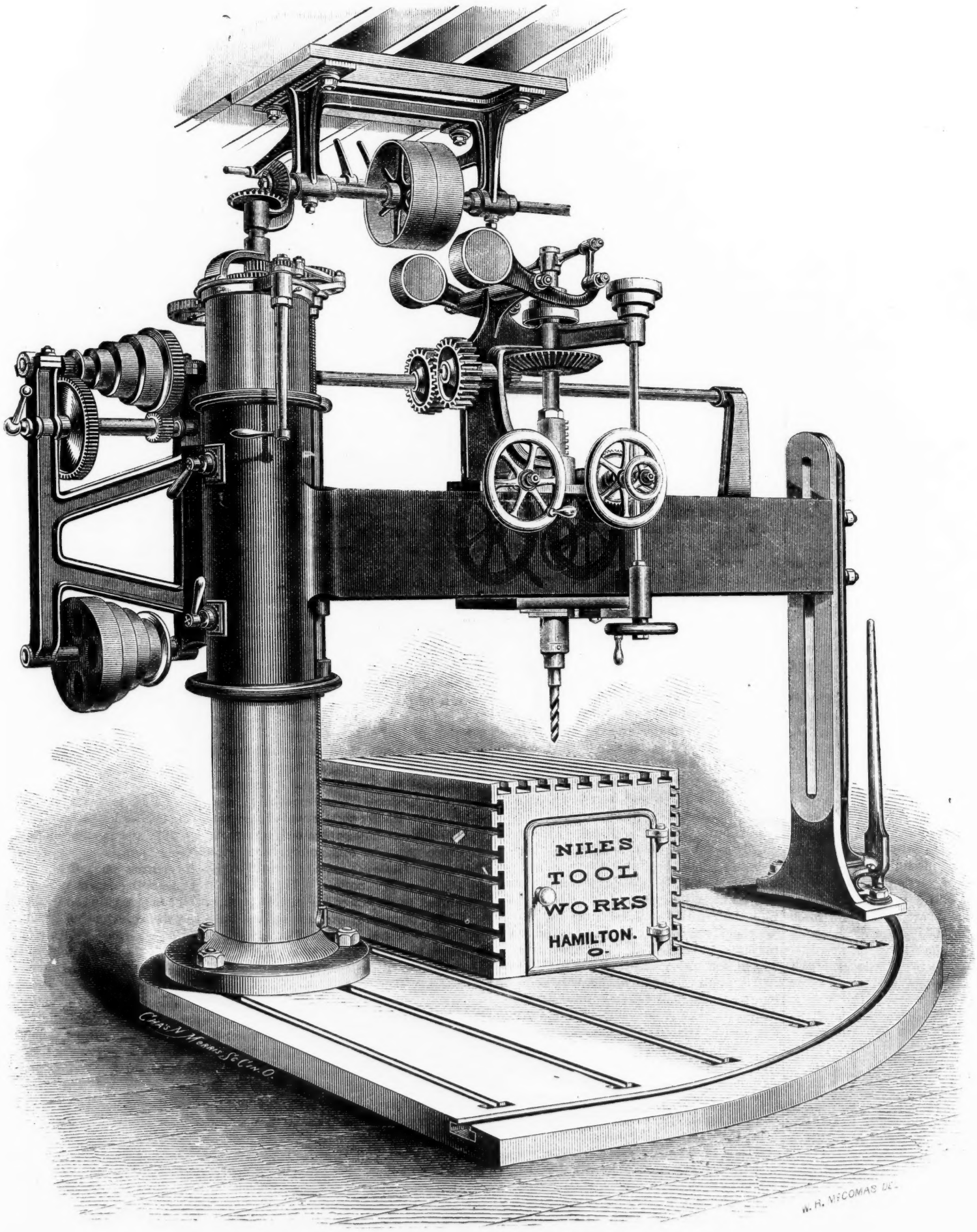
AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

VOL. 2, No. 2.] NEW YORK, DECEMBER, 1878. [$1.00 per Annum.
SINGLE COPIES, 8 CENTS.



RADIAL DRILLING MACHINE, BY NILES TOOL WORKS, HAMILTON, OHIO.

We present herewith an engraving of a Radial Drilling Machine of great reach and power, and with a very remarkable degree of adjustability accomplished by automatic mechanism.

We may remark that it is a singular fact, but none the less true, that of all the tools in a machine shop, the drill is the most neglected, and at the same time the most useful. The processes of planing, and turning even, are less employed than that of drilling. All kinds of pieces, whether heavy or light, with

but few exceptions, have holes drilled or bored into them, and we have only to ask our mechanical friends to think of the means now in use for this purpose, to bring to their minds the general crudeness of their character. We admit there are excellent vertical drilling machines, and excellent horizontal ones; but here, with hardly an exception, the adjustability ends as the spindles are rigidly forced and adjustment of the drill impossible. A heavy cumbrous piece must be moved to this fixed spindle, and we have two imperative conditions to fulfill, that of having the piece *level*, and at the same time have the center of the hole to be drilled directly under the point of the drill. The effort to get one condition disturbs the other, and so vexatious delays ensue; then again we want to bore a heavy piece, say a foot thick, but weighing a ton. Now we have encountered the dilemma of either getting it upon trestles or making a drill or bar long enough to reach it, and should our machine be of an insufficient capacity to "take in" the work, we must resort to a ratchet, and all that that implies. To return to the Radial Drilling Machine represented in our engraving.

The whole structure stands on a heavy sole-plate, slotted for bolting work, and planed perfectly true; it is revolved, as an entirety around a center sleeve (or inner column), fastened to sole-plate, and bearing well up into the main column. The column is turned true and parallel; it is ten feet high, but can be increased if so desired; the arm is raised and lowered on the column by power without any exertion on the part of the operator, and its bearing on the column is amply long. The reach of the arm from the column is about six feet; the drill stock is moved in and out on the arm by a quick hand movement; the spindle is counter-weighted, and has quick return motion and power-feed.

The outer end of the arm is arranged so as to be firmly braced and held by a slotted bracket bolted to the sole-plate; this bracket may sweep through an arc and accompany the arm, and it is provided with a traversing device, whereby, by a hand-lever moves both bracket and arm to any position in its arc. Under ordinary circumstances this bracket is not secured, so that, while it holds the arm for medium work, the arm may be raised or lowered or swung around, but for heavy work the bracket bolts are made tight, and give to the arm perfect rigidity, the structure forming an arch over the work. For jobs of the largest character the bracket may be removed entirely, thus allowing the arm to project over the edge of the work.

The box table is provided for pieces of ordinary size, it is not fastened to the sole-plate in any manner, its weight being sufficient to hold it in position; it may be readily moved aside, giving the entire surface of the sole-plate when so required.

The central overhead driving-arrangement is common to all the various styles of radial drilling machines built by this company. There are no belts to interfere with the complete circle the arm describes in revolving the machine; the power is carried through back-geared cones and a system of gears to the spindle; the cones are within easy reach and changes of speed can be made as readily as on an ordinary lathe

The power and strength of this machine is amply sufficient to bore work up to twenty inches diameter.

For further information, address the manufacturers, Niles Tool Works, Hamilton, Ohio.

Mr. Jerome Wheelock, of Worcester, Mass. received a Grand Prize at the late Paris Exhibition, the only one awarded for a Steam Engine. He has licensed a firm in Paris to manufacture and sell his Engine in France.

The judges of the late American Institute Fair in making an award to Prof. Carvalho for his system of superheating steam, used on the boilers during the Fair, reported as follows: "We consider this invention ingenious and useful. In our opinion the *results obtained are valuable*, as by its use the super heating of the steam is completely under control. Having been awarded the Medal of excellence last year, we recommend that it be awarded the Diploma of Continued Excellence."

Dry Plumbago vs. Tallow and Oils in Steam Cylinders.

Editors American Machinist:

Ever since the invention of the steam engine, the lubrication of the cylinder and piston has been attended, in most cases, with serious drawbacks, caused by the character of the lubricants used, or the changes which they undergo when brought in contact with steam. Tallow and animal oils, until within a very few years, were the only lubricants in use, sometimes supplemented with a little ground plumbago. Of late years, preparations of mineral oils, under various names, have come into use in some places. The writer of this article, an engineer of some years' standing, seeing and feeling, as it were, the bad effects of both tallow and oils on the engines of which he has had charge, it became a very important question to him whether there was not something that would do the work required without destroying the piston, joints, and valve faces.

Having heard of the application of dry plumbago, with success, it was concluded to give it a trial. The engine upon which the experiment was carried on was an 11x30 horizontal engine; piston speed, 300 feet per minute, and was known as the "West Poppet-Valve, Automatic Engine." It was worked up to its full capacity, and, to insure a fair trial, the existing oil-cup was exchanged for a goblet-shaped tallow-cup with a lid, after which the piston-follower and springs were taken out and cleaned. When ready to start the engine, one-third of an ounce of finely powered Ceylon plumbago was placed in the cup. As soon as the engine was fairly under way, the valve of the grease-cup was opened half way. After running some time it was opened all the way. When the engine was stopped at noon, on examination of the grease-cup, the plumbago had all passed into the cylinder, of which there had been strong evidence, soon after starting, as the piston-rod became coated with it. Upon starting up in the afternoon, one-third of an ounce more was placed in the cup, and the engine run until six o'clock, with a similar result. There was no noise in the cylinder, either in the starting, running, or stopping of the engine; and after eighteen months' use, with the above named quantity applied twice a day, no noise has been heard in the cylinder, except when the steam was shut off for the purpose of stopping the engine, when it would be heard during one or two strokes of the piston, just before the engine stopped. This occurred not oftener than would have taken place if tallow or oil had been used. Soon after beginning its use, a portion of the plumbago would be found remaining in the cup; to obviate this, about an ounce of water was poured into the cup, after the plumbago had been put in, when a decided improvement was observed, so much so, that it can now be fed into the cylinder as readily as oil or tallow. After four weeks' use, the cylinder-head was taken off and the working part of the cylinder was found coated with plumbago which could not be easily rubbed off with the fingers; the interior of the piston was found as clean as when it left the lathe, so far as dirt of any kind was concerned, and such is the condition to this day.

The gum joints (six in number), connecting the stuffing-box bonnets, valve-seats, and steam-chest to the cylinder had been renewed a few days before the new lubricant had been applied; they are in perfect condition to-day, showing no signs of leakage; whereas, if oils or tallow had been used, they would have had to be renewed twice in that time. As to choking up of passages, from past experience, there seems to be no need of apprehension, and so satisfactory have been the results that the old-style lubricators will not be resorted to soon again.

Now, Messrs. Editors, as atoms make up the mass, and drops fill up the ocean, I thought, perhaps, this slight contribution might add something to the general stock of information on the subject of lubricating steam cylinders.

Wm. J. Williams,

611 St. John street, Phila.

Annual Report of the Hartford Boiler Insurance Company.

In our last issue we gave some extracts from report of work performed by the Hartford Steam Boiler Inspection and Insurance Co., for the year 1877. The annual report of that company is somewhat late in issuing but contains so much information of the greatest value to users of steam boilers that the thousands of people directly interested in managing them who have anxiously waited for copies of the report will excuse the delay. Mr. J. M. Allen, the active and efficient president of the company, has collected during the 12 years it has been in operation, a reliable fund of information, the results of experience, in regard to the construction and management of steam boilers, the most important of which is presented in his annual reports. Each of these makes a valuable manual for steam users. We quote from the report for 1877.

"It is believed that no business can be so well understood and so thoroughly done as by devoting special and entire time to its development. The frequent boiler explosions in the land from year to year called for some intelligent investigation into their cause. Were they the result of poor material, poor workmanship, careless management, or, all three together? These are questions of great importance, not only to the manufacturer, but to the people in his employ. The use of steam power has increased vastly within the past ten or fifteen years. Boilers of various types and materials have been devised. Some inventors have devoted their time to the production of a 'non-explosive' boiler, while others have turned their attention to the question of economy in fuel. The combination of different materials in construction, varying greatly in the matter of expansion and contraction under different degrees of heat, have rendered many of these efforts entirely fruitless. It has been a favorite idea with some, that if instead of confining the water and steam in a large reservoir or cylinder they can be circulated through small pipes, the great danger of destructive explosions would be avoided. It is found, however, that the character of the water has much to do with the usefulness of such boilers. In localities where the water deposits a heavy scale, small passages are very liable to get filled up, notwithstanding the claim that rapid circulation prevents the accumulation of such deposits. That some of these types of boilers work well in localities where the water is comparatively pure there is no doubt; but their success has not been so marked as to satisfactorily settle the question of their adaptability to general use. In saw-mllls, tanneries, and establishments remote from great centers, difficulty is often experienced in making repairs easily and readily on sectional boilers, especially if they are partly or wholly constructed of cast-iron. Special castings must be obtained, and special workmen must be sent, often from great distances. These are some of the difficulties which we have noticed. They are not mentioned to disparage the efforts of those who have labored to produce a 'non-explosive' boiler, nor to interfere with any honest industry, but to point out some of the difficulties which must be overcome before complete success can be attained.

"Another matter, which should be better understood by those purchasing boilers, is 'competitive tests.' At mechanics' and industrial fairs are usually found all kinds of steam boilers, each claiming points of superiority in economy and efficiency over others. The greatest care is exercised in running the boilers during the trials; expert firemen are employed; the water and coal are carefully weighed; the inflow of air into the furnace is measured with great accuracy; all escapes of steam by even the slightest leaks are stopped; the temperature of the uptake is regulated with the greatest care, so that the least possible heat shall be wasted, and yet be kept high enough to be considerably in excess of the temperature due to the pressure of steam.

"The result to be gained is, the evaporation of the greatest quantity of water by a certain number of pounds of coal, within a certain time, and this is called the evaporative efficiency of the boiler. But in making these *tests* particular attention should be given to the dryness or humidity of the steam.

"The heating surface of boilers is often so arranged as to supply over-saturated steam, which is mistaken for evaporative efficiency. It is found that over-saturated steam, when supplied to an engine, does not give the power due to the consumption of fuel, and hence the rate of evaporation *must not* be regarded as a reliable indication of the steaming capacity of boiler.

"The man purchasing a boiler should understand that there is little or no probability of his ever attaining, in daily use, such results as have been attained under the tests. He must remember that these results have been secured under the most advantageous circumstances, and if he purchases a boiler and it does not meet his expectations, he will understand from the foregoing why. There have beeen serious mistakes made by inducing steam-users to purchase boilers which in type and construction were not adapted to their wants. Some manufacturers have but an imperfect knowledge of steam and steam machinery. Being in want of a new boiler and the necessary attachments, they apply to some competent person for plans and specifications. These are furnished after a careful consideration of his particular wants. They are taken to a boiler-maker, and he begins to suggest changes, and he is allowed to change here and there as he chooses. Soon an agent for a new kind of grate-bar appears; he tells how much Mr. A. or B. thinks of it, and "whips" out a recommendation that sets it high above everything else.

"No sooner is this done than an agent for some other attachment appears and convinces the manufacturer that the use of it will save him ten per cent. of his fuel, and so the work goes on until finally the boiler is set up and ready for use. The person who prepared the original plans and specifications calls in to see how nearly his plans are carried out, and finds something different from anything he ever saw or dreamed of. He expresses some surprise, but the manufatcurer assures him that every one of those changes and attachments *will save fuel.* When the various guarantees are figured up it is found that some fifty per cent. of the fuel is to be saved. The boiler is started up, and found, with all its well-recommended changes and attachments, to possess no advantages over the one called for in the original specifications, but, on the contrary, discloses disadvantages which give constant vexation and trouble.

"Another point is the *horse-power* of boilers. This depends upon the area of fire-grate and heating surface. There is no arbitrary rule which will apply to any and all boilers. Hence manufacturers are often misled by the statement that a boiler of a certain size is of a certain horse-power.

"The average horse-power may be approximately jumped at. But when we come to investigate the subject we find that 'the evaporating capacity of a steam-boiler fired with a given kind or quality of fuel depends upon the extent of area of fire-grate and heating surface.'* The real power of a boiler is the evaporation, which depends upon the firing, circulation of water, and other variable circumstances. One manufacturer of boilers may place the horse-power of his at a medium rate, while another for a less price may agree to furnish a boiler considerably in excess of power, but which, when constructed, is found to be of even less capacity and perhaps of inferior workmanship. We are always suspicious of those who are ever ready to furnish a great deal more for a much less price, than an honorable competitor can afford to do. Rest assured there is something which the purchaser does not fully understand, but for which he will pay dearly in the end.

"This will be better understood by the following illustration. It is common among boiler-makers to estimate the horsepower of boilers by allowing a certain number of square feet of heating surface for one horse-

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* Nystrom.

power. Some claim as low as ten square feet as sufficient, while others place it as high as eighteen square feet. We will assume fifteen to be a fair average. Now we have a boiler five feet in diameter, fifteen feet long, with sixty-six three inch tubes. What is the approximate horse-power?

"If we allow ten square feet of heating surface, it will be nearly ninety horse-power. If we allow fifteen square feet it will be about sixty horse-power. Hence we see that the same boiler will be differently rated by different makers, and the manufacturer who purchases on the former estimate—being ignorant of the rules by which horse-power is estimated, is made to believe that he has obtained a very large boiler, at a very low rate, when in fact he has gained nothing over the boiler that was offered by a more modest and probably more reliable boiler-maker.

"Another method of increasing the apparent horse-power of a boiler is, by increasing the number of tubes. The argument is, 'The more tubes, the more heating surface, consequently the greater efficiency.' This may be true to a certain extent, but there is a limit which cannot be passed with economy. If a reasonable number of tubes is exceeded they must be put in very close together, or carried up so high as to enroach upon the steam space. In the former case circulation is interfered with, and if the water is bad, the spaces between the tubes and between the tubes and shell become filled with sediment and scale, and the efficiency of the boiler is greatly impaired; besides, the tubes, being unprotected by water, soon burn out. In the latter case the steam-room being reduced, the steam is liable to be highly saturated, and, as has already been said, 'over-saturated steam when supplied to an engine does not give the power due to the consumption of fuel.'

"Experience has shown that comparatively large tubes, with ample spaces between, is the best method of consrtucting steam boilers. We have made it a rule to advise our patrons on these points, and to prepare for them specifications, drawn with care, for just such boilers as their wants require. We examine them while they are being constructed, and when completed, if found to comply with the specifications, they are approved, and a certificate is issued to that effect. We often find manufacturers who claim that they hold our certificate that their boiler has been approved by us. But upon examination, the *name of this company* is not found thereon. Hence the certificate has been issued by some other party, who does not guarantee it; and investigation may reveal the fact that the certificate has been issued by some one in the employ of the boiler-maker, which, while honestly certifying in some cases to good workmanship, cannot have the weight that a certificate would which was issued by a disinterested company organized for that purpose and backed by an ample capital to make its certificate and guaranty good.

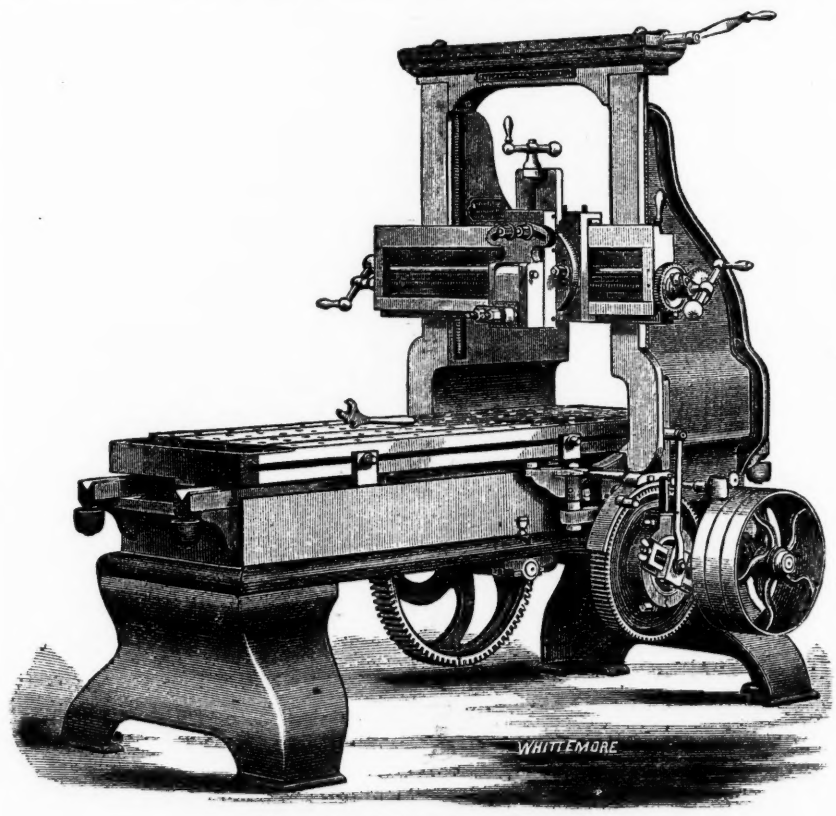
"These points are discussed for the benefit of manufacturers. There are always men in the field who will attempt to prove that *white is black*, if they can but prevail upon people to purchase their wares. The ease with which 'recommendations' are obtained is also astonishing. Men who have the reputation of being very careful and conservative, are often induced to put their names to "recommendations" which give them no little trouble for a long time after. We know of instances where manufacturers have signed a recommendation of certain boiler appliances which shortly afterwards proved worthless. The machine was discarded, but the recommendation was published over and over again, and the manufacturer was made to testify to the excellence of a thing which experience had proved to be worthless and an imposition. Now would it not be well to wait a little and see how a thing works, before rushing into print over its merits? Experience has taught that a good thing is always the best and cheapest in the end; and while there may be improvements on this or that appliance or machine, be sure it is all that it is represented to be before you state in writing that it is 'perfectly satisfactory, and accomplishes all that is claimed for it—*and more.*'

"In the care and management of steam boilers, one cannot be too careful. It is poor economy to buy 'cheap' boilers, or to employ 'cheap' help to have the care of them. The lives of operatives and others are too valuable to be put in such jeopardy. True economy is commendable, but that economy which saves a dollar at the risk of losing hundreds, is false, as experience has often shown.

Improved Planing Machines.

The illustration on this page represents one style of an improved metal planing machine, manufactured by C. Whitcomb & Co., Worcester, Mass. For over twenty-five years, Mr. C. Whitcomb has made a specialty of designing and building iron planers, during which time he has made a number of improvements greatly simplyfying this tool and rendering it capable of working with less shock and much less power. He has probably given more practical attention to perfecting the iron planer than any other man in this country, having made about 1,500 of them which are in use not only throughout the United States but a number of them in foreign countries.

The Whitcomb planer is heavy, substantial and well-proportioned in all its parts, has large shafting, long bearings, cap-boxes, gears and racks all cut, cross-head fits all, scraped holes in table, drilled and milled, slots in table planed out of solid stock with the best self-acting cross-angular and vertical feed. They possess a patent friction-feed and a device for fastening the cross-head. The feed is simple and entirely disconnected from the shipper motion, which allows the planer to perform its feed and shipping in two inches movement of table. The common friction feed makes a constant lug on the power and hastens the wear and tear of the machine, while this friction-feed works smoothly without drag. The cross-head fastening is instantaneous in operation, effectual and durable. It obviates the necessity of fastening with bolts and nuts, requiring one or more journeys around the machine to liberate and secure again the cross-head ready for use. Within five years past, Mr. Whitcomb has adopted two belts instead of one. The five-foot planer is made either with straight posts, or with posts set off as shown in the cut. One style is made with all the gearing thrown on the back of the machine, instead of on front, as here exhibited. The material and workmanship of Whitcomb's planers are first-class.



WHITCOMB'S IMPROVED PLANER.

Free Trade seems every day to be losing popular favor in England.

A German View of American Machinery Practice.

A new illustrated German work, by Dr. Hermann Grothe, has been published in Berlin. The author visited the Centennial Exhibition, and embodies in his book his observations of American industrial progress. We quote the following from a review of the book in the *Penn Monthly* for October:

"Our author remarks that Americans began by employing European, and especially English, models in the construction of their machinery, but for fifty years past they have, for various reasons, departed from the English system. For one thing, the English method kept steadily in view the construction of machines of great weight, which was quite in accordance with the nature of English industry and its competitions. American machinists, however, aimed at producing lighter machines, tools and weapons. The English aimed at producing machines which could be employed for a great variety of uses. The Americans found it best to specialize their machinery, and to so construct them that every part was machine finished, and capable of being replaced by another exactly like it. He is struck with the difference of American and European methods on many points, as in the finish of the machinery, the extensive use of heavy drop hammers in shaping both hot and cold metals; the disposition to use two machines, where one is employed in Europe; the manufacture by machinery, and, in large establishments, of many articles, such as screws, which are not so made in Europe, and the extensive use of cast iron in connection where wrought iron, or some other substance, is used in Europe."

Machinery Business in Worcester.

WORCESTER, MASS., Dec. 3, 1878.

Editor American Machinist. — The machinery business which forms so large a part of the industry of this city does not improve to the extent that was hoped for at the beginning of the present year, yet there is "light ahead," and we have, let us hope, seen the darkest season pass away. Buyers of machinery, who were accustomed before the Panic of 1873, to come to Worcester from all parts of the country have become scarce, probably because their purchases each amount to so little that the business can as well be transacted by mail. The shops employ on the average about the same number of men that they have for many months past. The Boston, Barre & Gardner Railroad Shops have just discharged twenty-five men, and the Boston and Albany shops quite a number, not because they have any less work, but to reduce expenses. Those retained in employment will probably have to earn all the wages they get.

Good machinists are paid $1.50 to $2.00 a day; more receive the former than the latter amount. Those employed on piecework may, in some cases, do better, but the prevailing custom here is to employ mechanics by the day. The best manufacturing business for a year or more has been wire making. The Washburn & Moen Manufacturing Co. is now employing about 1,600 hands, and runs some departments night and day. The new Worcester Wire Co., who started work during the present year, is securing a good trade, and gradually enlarging its capacity. The Wood-working machinery manufacturers are experiencing an extremely dull time, but in machine tools a ripple of improvement may be noticed. The winding up of the Wood & Light Machine Co.'s affairs causes wide comment. The concern was one of the oldest machine tool making establishments in Worcester, and had the largest floor-space of any shop in town. The business of the company does not seem to have prospered for two or three years past. It appears to have wasted away by the dry-rot—anyhow the company has "passed in its checks," and the good-will, patterns, etc., may pass into the hands of others or be suffered to take a long rest. The bulk of the machine-tool business here is now being done by David W. Pond and P. Blaisdell & Co. Mr. Pond has the largest shop, and employs about 100 men. He has been improving his tools and changing to entire new patterns during the present year. This, with other points of enterprise and constant attention to business, is telling largely in his favor. Blaisdell & Co. have for years past made a specialty of engine lathes and upright drills. They build good machines; keep up to the times; are employing a good force of men, and are not likely to see their trade slip away. The Lathe & Morse Tool Co. is an old concern in the machine tool line, with a good reputation both for business credit and quality of their productions, but their shop has been very quiet for several months. They are, I understand, preparing to offer some late improved tools.

J. S. Wheeler & Co., who were formerly prominent among the machine tool makers, now do scarcely anything but jobbing. Mr. C. Whitcomb is building some iron planers, a tool he has made a specialty for many years, and with which he has been very successful. Machine screws are always in active demand here. Mr. Gifford, the enterprising head of the Worcester Machine Screw Co. has brought his automatic machinery to such perfection as to produce screws not only very rapidly, but of uniform accuracy. His extensive works are pushed to their full capacity. McCloud & Crane are also doing a good business in making machine screws.

In my next I will have a word or two to say about some of the other shops.

Yours,

CHUCK-TAP.

Our Exchanges.

THE OFFICIAL GAZETTE OF THE UNITED STATES PATENT OFFICE. This valuable weekly publication, issued from the Patent Office, contains the titles, briefs, drawings and claims of every patent issued; also decisions of the courts, commissioner's decisions, and miscellaneous information for those wishing to secure protection to their inventions, designs and trade-marks. The photo-lithographed drawings are clear and well executed, though reduced from original size. The *Gazette* is furnished at $6 a year Address the Commissioner of Patents, Washington, D. C.

DER TECHNIKER. We have received the first few numbers of a German mechanical weekly (printed in Roman text), bearing the foregoing title. It is a 16 page illustrated paper, and its contents bear evidence of good mechanical knowledge and journalistic ability. We wish it a full measure of success. Published by Paul Goepel, Tryon Row, New York.

On Boring Locomotive Cylinders.

BY L. F. LYNE, M. E.

It is our purpose in this paper to describe what we believe to be serious errors in the old and usual way of boring cylinders, as practiced in locomotive repair, and also in some marine and stationary, shops. And we state at the outset that the writer is aware of the existence of a special machine for boring cylinders, which will bore a cylinder and finish it in the remarkable short time of three and one half hours. But such a machine is very expensive and is only economical in a contract shop where a large amount of new work is done, as it is only adapted to boring cylinders. It is customary in most shops to use a boring bar with a traverse head, which holds the cutters and is moved or fed along the bar by means of a screw let into one side of it, and derives its motion from either a star wheel or a system of gears attached to the end.

We find in practice that a 40 in. lathe is the most economical for this purpose, as great power is necessary to drive the bar with a respectable cut, and it is materially impossible to make time in boring a cylinder of 16 in. or 17 in. diameter on any lathe smaller than the one just mentioned.

Having settled the question of lathe, we next find it necessary to devise means to secure the cylinder to the shears or bed plate of the lathe. This is generally done in the manner represented by Fig. 1, where the cylinder is placed with the valve face up upon two blocks, A and B, usually made of 8 in. x 12 in. timber, and are cut out to fit the outside of it. Two other pieces of timber C and D are placed across under the bed of the lathe, and also two other pieces or bars of iron represented by E and F across the top.

The whole is now secured by four ⅞ in. stud bolts passing through the ends of all these pieces, two in front and two back of the cylinder with nuts, top and bottom, screwed down tight.

Now we boldly assert that the operation described above, and which the writer has witnessed in nearly every shop where he has been engaged, is all wrong from the very commencement, and which we shall proceed to demonstrate.

First. It being necessary to secure the cylinder to the shears of the lathe to hold it firm, therefore the weight should be placed as low as possible. To illustrate, it will be observed by a reference to Fig. 1 that the cylinder is placed with the heaviest side up, consequently a very little jar, even a truck drawn over the floor will cause a vibration of the lathe which interferes seriously with the work.

Second. The very first and most important consideration in placing the cylinder in position upon the lathe is to secure it so firmly that there is not the slightest possibility of its shifting, therefore we object to placing it upon wood, because the blocks never fit the outside of the cylinder exactly, as will be seen at a glance; and when the bolts are tightened the wood will yield to an alarming extent. This necessitates a series of operations of tightening and loosening until the work is finally brought into the proper position, consequently a large amount of valuable time is wasted and the workman has tried his patience to the extent as to use cuss words occasionally.

Third. When the first cut is run through the cylinder and the work tested, it will be found that it has shifted owing to the yielding of the wood; however if this variation is but slight the foreman will say, "Oh that's good enough, let her go," which is equivalent to saying that it will be an inferior job when done. Good enough in our estimation always implies that the work is not first class. Another objection to wood is the necessity of having an extra set of blocks for every different size cylinder, otherwise a great many insurmountable difficulties will present themselves.

Fourth. It is impossible to take a heavy cut unless the work is solid, and for like reason it is impossible to get a smooth bore.

Fifth. By a glance at the cut the reader will observe that all the power exerted to hold the cylinder is applied across the top of it, which is a monstrosity in itself, and for this reason alone, if for no other, the above plan should be abandoned. We do not remember of ever seeing a perfectly round hole bored in this manner, but we do remember of seeing a cylinder of 34 in. diameter sprung ¼ in. out of round by this process, and all the result of putting the pressure across the top.

There are other reasons why this plan should be abandoned, but we trust that the ones just mentioned will be sufficient to convince any intelligent mind of their impracticability.

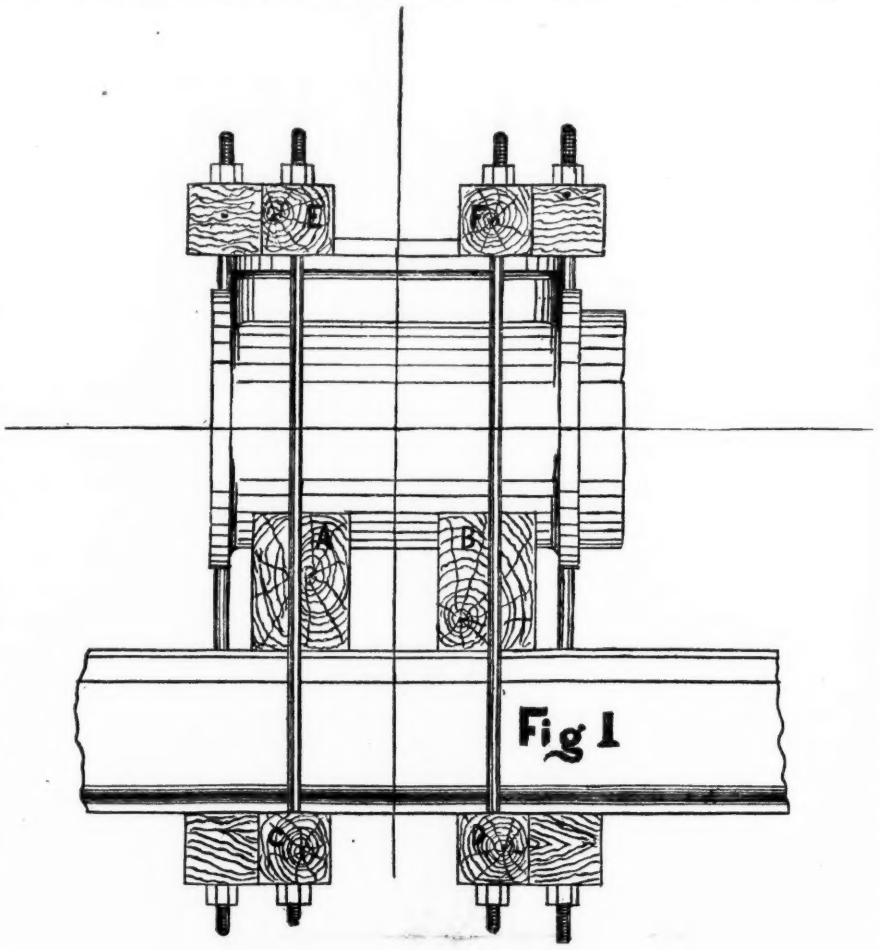


Fig 1

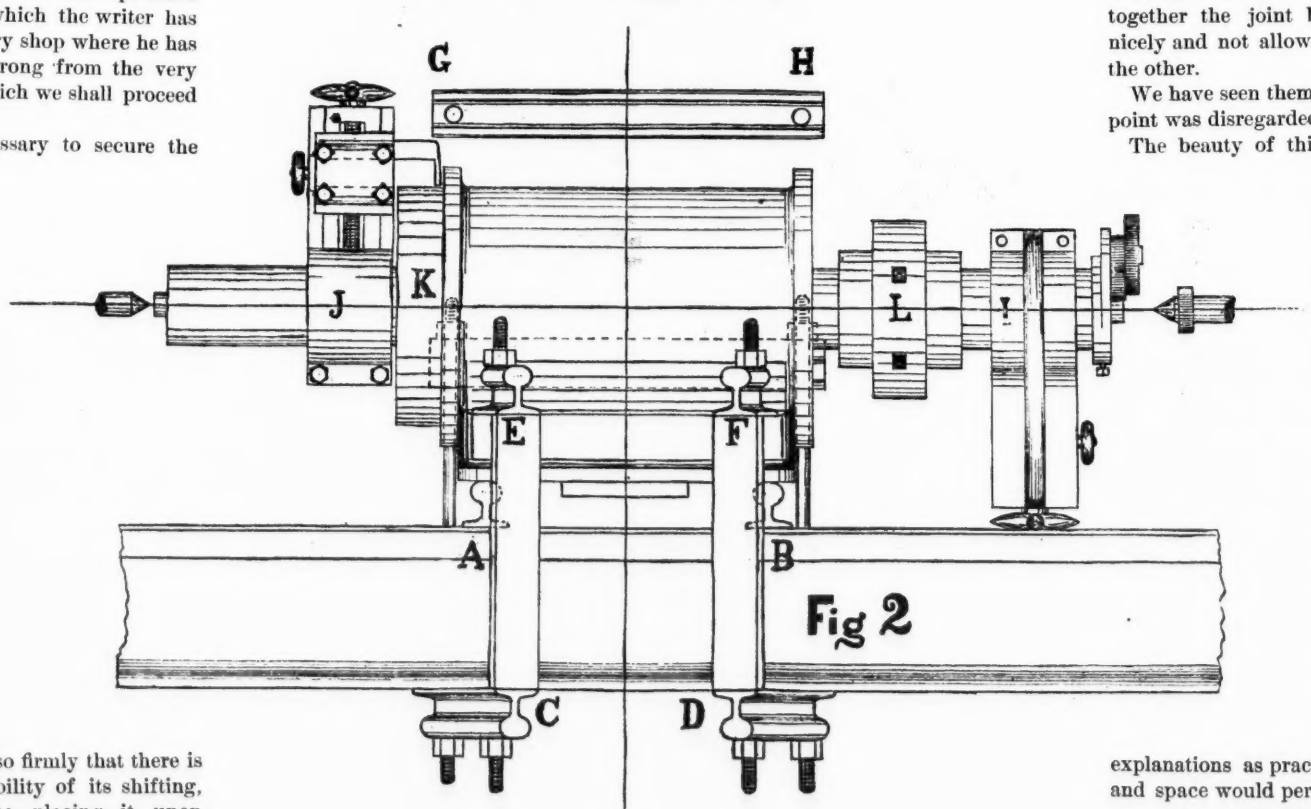


Fig 2

We will now endeavor to explain what we believe to be the most simple and also the best way of holding a cylinder for boring. If the reader will examine Fig. 2 we will compare the same with the objections made to Fig. 1. In the first place, the weight should be as low as possible, and to do this we simply turn the cylinder upside down as shown in the cut, and place under it two short pieces of old railroad iron, A and B, across the shears. A very valuable improvement on this plan is to have a cast iron plate with set screws for adjusting, planed so as to fit over the top and particularly on a lathe with V shears. The lathe used by the writer had flat shears and we experienced no difficulty.

The pieces of rail referred to will bring the centre of the cylinder about right with the center of the lathe. The advantage of placing it upon iron instead of wood is, that it is only necessary to set it once as the iron can be depended upon every time. We now insert the boring bar through the cylinder, place the two heads, I and J, for turning off the flanges upon it (see cut) and hang the bar upon the centers. Now set the cylinder by the bar which may be done by measuring from the bar to the outside of flange on each end of it, which we have found to be a reliable point to work from.

After the cylinder is set in the right position care should be observed in blocking up the corners so that there may be no rocking motion to it, as it would be sprung by bolting down. The pieces of rails used under the cylinder will answer for different sizes, thereby avoiding the necessity of any more blocks. The cylinder having been set true with the bar, we now place two pieces of old rail, C and D, across under the lathe, with holes about 2 in. from the back ends.

On the front ends the rails should project beyond the holes about 16 in. to furnish a support for two upright pieces of wood 4 in. by 4 in, on the top of which is placed two pieces of rail E and F, one end resting upon these upright pieces of wood and the other resting upon the flange formed by the top of the cylinder. The back side of the cylinder is to be secured by a piece of rail, G H, which is to be placed on the part intended for the engine frame. The bolts may now be inserted and the nuts tightened

It is now necessary to test the cylinder to see that it has not changed its position.

The head J may now be moved up so as to just clear the sinking head K and with a tool placed in the head J cut it off. We now place three tools in the traverse head L, and arranging them so that they may cut about equally run a rough cut through the cylinder. The head L should now be left inside the bore as to be out of the way, and the heads, I and J, brought up near the flanges, face them and turn off the outside.

It is now necesssry to run a finishing cut through the cylinder and counterbore both ends. It is a good plan to test the face of joints on each end of the cylinder to be sure that it has not moved, although we never had one move when secured as previously described.

One other point to be observed is, in setting the second cylinder of a pair, if the cylinder and saddle are in one piece, and that is, to set it so that when the cylinders are bolted together the joint between them may fit nicely and not allow one to project beyond the other.

We have seen them project ⅛ in. where this point was disregarded.

The beauty of this method of holding a cylinder is that there is nothing used but scrap rails which are inexpensive, and when once fitted up are a permanent tool just as much as any tool for the lathe.

In the foregoing instructions it may seem to the experienced mechanic that some of the ideas advanced are tame, and we at once admit that. But we have assumed that the reader knows nothing about boring a cylinder, and, as the title of our article indicates, we have endeavored to make our explanations as practical and plain as time and space would permit.

The horny handed workman calls it "pay;" the skilled mechanic, "wages;" the city clerk, "salary;" the banker, "income;" a landowner, "revenue;" a lawyer, "fees;" a burglar, "swag;" but it all comes to the same thing at the end of the week.

Sometimes the services of a civil engineer are cheap at twice the money. A Henderson County farmer worked four days digging a ditch to drain a bit of low meadow of his own into a big pond on another man's farm. And when the ditch was opened the pond just walked right into the meadow and located about twenty acres of swamp right where the hay used to grow. And the farmer was just the maddest man. — *Burlington Hawkeye.*

The Starter and Stopper.

(Continued from the October number.)

BY STEPHEN ROPER, ENGINEER.

The proprietor of a large printing office suspecting that his engineer was in the habit of taking a little too much of the juice of the barley, told his clerk if any engineer should call in search of employment to take his name and residence. Shortly afterwards a party enquired if they wanted an engineer in their establishment; he was told not at present, but there might be an opening in a few days, and if he would leave his name and address, he would be sent for as soon as occasion required. A few days afterwards the regular engineer failed to put in an appearance, and as the proprietor suspected he was "tipping the rosy," the evening previous, he came to the conclusion that he would not be annoyed in that manner any longer, so he instructed his clerk to send for the party who left his name. This was done, and the man with blue overalls and jumper was soon on hand. He glanced around the engine room and into the furnace, exclaiming that the old engineer had been robbing the owner by consuming twice as much coal as was necessary. It was a large fire box or locomotive boiler. The new comer told the boss that if he would send for a hundred fire brick he would fix the furnace so that it would consume only one half the quantity of coal it had previously done. The owner of the boiler, though a man of great means, was remarkable for his closeness in expenditures, and he jumped at the idea of saving half the coal. He accordingly sent for the fire brick, and as it was Saturday he told the Starter and Stopper to get along the best way he could until noon, after which he might blow off the boiler, and arrange the furnace to suit himself. Accordingly he commenced and laid a wall of fire brick upon each side of the furnace from the grate bars nearly to the crown sheet. But as the heads of the stay bolts protruded some distance through the sheets, the fire brick did not lie close up to the furnace plates. As a result there was an air chamber at each side, back and front. After he finished the job he placed his wood and shavings in the furnace and about 1000 pounds of coal preparatory to starting.

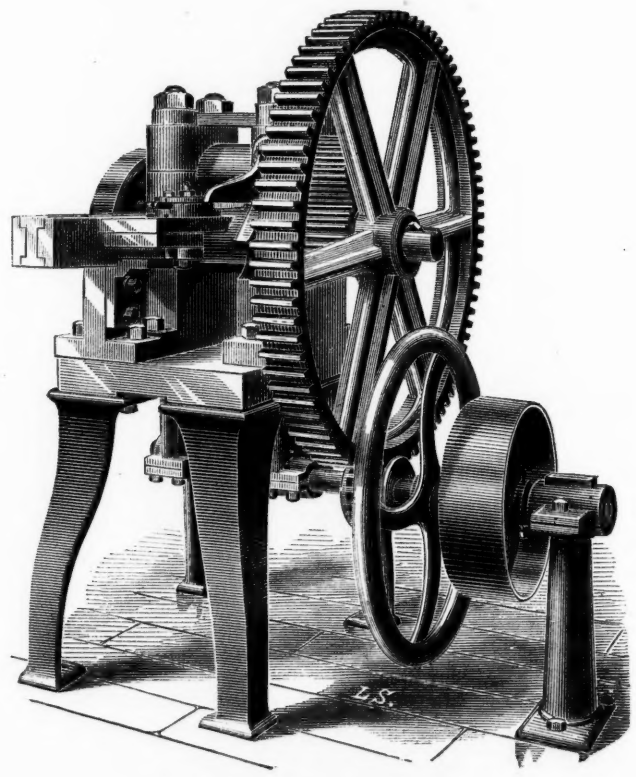
He lit his fire at 6 A. M. Monday morning, and at 11 o'clock the steam gauge showed 5 pounds, and the coal was barely red in the furnace. The air that should have passed through the fire escaped between the fire brick and the side of the furnace. The owner of the steam engine sent for a neighboring blacksmith, and by means of long nosed tongs, and post hole shovels, the bricks were removed from the furnace and the coal distributed on the grate, after which the pointer of the steam gauge began to move up. The "Starter and Stopper" was told to move up to the office as the clerk wanted to see him.

The engineer in a large spice mill was compelled by sickness to give up his situation, and as the engine was 150 horse power, and was taxed to its utmost capacity, the owner was anxious to secure the services of a first-class engineer to take his place, wages being no object. He told the old engineer that he would consider it a great favor if he would recommend the right kind of a man to take his place, until such time as he would be able to resume his duty. The engineer remarked that a fine able-bodied young man had often called to see him, and talked about the great number of engines he had run in his time, their size, etc., he had no doubt but that he was just the man. Accordingly he went in search of him, and when brought in and questioned, stated that he had run a great many engines in the South and West, none of them less than 300 horse power. He was told to take hold. The fuel was dust coal burned with a blast. As soon as he entered the boiler room, he asked the proprietor if the old engineer could keep up steam with that kind of coal, and when answered in the affirmative he remarked that if that was so he could keep it up with brick-bats. About half an hour after he took charge, he appeared in the office with his overalls under his arm, and stated he had just received a dispatch that his grandmother was dead. When questioned as to how he could receive it as no one could get to the engine room without passing through the office, he said there was no use going into details when there was a death in the family. It was discovered after he was gone that two of the fires had nearly gone out, and the engine stopped on the dead center while the steam gauge showed only 25 lbs. pressure to the square inch, though the working pressure was 90. On comparing his statement as to the number of years that he had been running each engine before he came there, it became evident that he must have been running a 500 horse power engine when he was 4 years of age.

The war between the North and South brought a great many refugees into this section of the country, and among the rest a colored gentleman who claimed to have run engines in the South. Hearing that a Quaker was in need of an engineer, he presented himself for the position; and as the "good friend" had a decided partiality for "ivory and wool," he told the "man and brother" to take charge. At the same time he suggested to him that he should lubricate the cylinder twice a day. Accordingly the first time that he did so, he removed the cap of the oil cup without closing the lower valve, the result of which was he received a discharge of boiling oil and steam full in the face. When the Quaker returned he found "Mr. Gumbo's" head done up in sweet oil and cotton batting, and when asked what was the matter, he stated that was the darndest engine he had ever had anything to do with, as the first time he undertook to oil the cylinder she spit in his face; she must have been built by a rebel.

A country chap came to the city and by means of a good deal of cheek, gab, and a bogus recommendation, he found employment as an engineer. That same night he sat down and wrote home a glowing account of his great exploits as an engineer. A day or too afterwards he was visited by one of his townsmen, and by way of showing him what an adept he was in engineering, lifted the safety valve, blew the gauge cocks and did other wonderful things. It so happened that there was a *Lithgow* combination, mercury gauge attached to the boiler, and though he literally knew nothing about its operation, he pretended he did, so he opened the drip cock in the bottom, and immediately the steam rushed down, drove the water out and shattered both columns, blowing off a piece of his ear and burying about a tablespoonful of glass in his skull. The visitor had the skin rolled up in flakes on the back of his neck, after which he made his escape under a cloud of steam. He stopped at a tavern about a mile distant and swore that if ever the engineer made his appearance in his native town he would have his head busted. When the "Stopper and Starter" recovered from the shock, he rushed out in search of the visitor and declared that if he met him he would murder him on the spot.

A young man who stated he had just arrived from Harrisburg, where he had been running engines for several years, answered an advertisement for an engineer in a fancy printing establishment. When asked if he had a recommendation from his last employer, he stated that as he had not come to the city to look for employment, but to visit some friends, he did not bring it along, but that he would write for it immediately. He was hired and told to take charge. The engine was an upright and located in the second story. That afternoon the governor belt broke, and she commenced to increase her speed at such a rate as to make the building tremble. The new man from Harrisburg never made any attempt to shut off the steam, but jumped on a dry goods box, lifted the safety valve lever and commenced to blow off steam, after which one of the press hands closed the valve and the engine stopped. "The Starter and Stopper" remarked that he never thought of that.



COLD ROLL POINTING MACHINE.

On the first indications of the strike of the Locomotive Brotherhood of Engineers a few years ago, the superintendent of a rail road not over a hundred miles from New York, thought that in time of peace he would prepare for war, and engaged a few engineers to take place of the strikers in case an emergency should arise. A few days afterwards a person appeared at the office and enquired if there were any locomotive engineers needed. He was told yes, and asked on what road he had been running; he stated on that very same road, and when asked what time he fixed the date at about 20 years before the superintendent was born, although they both appeared to be about the same age. By way of showing his ability, he stated that on one occasion finding himself a little behind time, he pulled the throttle and let her slide; he got up such speed that he melted the two crank pins down on the track. On another occasion, he was coming down from the mines with a train of 100 loaded coal cars running at a speed of 40 miles per hour, and he thought he discovered danger ahead, so he reversed her under a full head of steam, and piled every car in the train one on the top of the other. Now the average iron coal car is about 9 feet long, which piled one on top of the other would make a shaft 900 feet high. Even the Pyramids of Egypt would be dwarfed in the shadow of such a dark frowning column. The superintendent thought that, though such a man might increase the wrecking business considerably, he would not facilitate the transportation of freight very much, so he informed him there was no opening at present.

Another party presented himself at the same office and stated that he understood that they wanted locomotive engineers. The superintendent informed him that he would hire a few of the right kind if he could find them. He asked the applicant where he had been running last, and was told on the military rail roads carrying supplies to Sherman's army down in Georgia, and to show how competent he was, stated that on one occasion when he went down with a long train of cars, the rebels burned a bridge over a river while he was gone, and on returning discovering the dilemma in which he was placed; but feeling that he was equal to the occasion, he backed his locomotive about 3 miles, turned on full steam and let her slide, when she went over safely. The superintendent knowing that there were a great many bridges on his road between there and the coal regions, and that the "Molly Maguires" were commencing to be troublesome, thought that possibly he might have use for a few such hands. He told him to come on the next morning, when he was given charge of a locomotive attached to a construction train, and told to proceed up the road until he came to a certain siding, and switch off until the regular down train passed. Now it so happened that there was a train of stock cars standing on the upper end of the same siding, and instead of shutting off the steam and bringing his engine to a stand still, he dashed on at full speed until the locomotive struck the stock car, telescoped the whole train, and scattered a shower of pigs and sheep over the road and into a neighboring corn field. When asked why he did not stop the locomotive before it approached the other train, the "man at the throttle" answered that her valves were "cocked" and whenever she was that way nobody could stop her.

Cold Roll Pointing Machine.

The cut herewith represents one style of J. Adt's cold roll pointing machines, for rolling square, fleam, or chisel points on picture and other nails, staples and similar articles. He makes different sizes and styles, adapted to all kinds of this class of work, and arranges them with full automatic feed, taking the wire directly from the hank and producing the article complete; or with hopper feed, to take partly finished articles—like headed nails &c.—and point them, or with a hand feed. There are many bright articles which require pointing, which is commonly done by blacksmiths, requiring the use of heat, and greatly injuring the finish; such work can be done much more rapidly with these machines, effecting a saving of from two to five hundred per cent. in expense, besides finishing the work in far superior manner.

For further particulars address the inventor and manufacturer, John Adt, New Haven, Connecticut.

JOBBING done, and inventions worked out; inventors assisted, by "Jack of all Trades." Address ——:

The above brief but comprehensive advertisement appears in a late number of an English mechanical journal. It suggests a great deal to an inquiring mind. The individual making the announcement would, undoubtedly, be a handy man to have around the house, the office, or the shop. If an inventor gets puzzled in devising a new mouse trap, Mr. "Jack of all Trades" could be called upon for reliable information about the tastes, habits, and inclinations of rodents in general, and the mouse in particular; also where to place the bait in the most seductive way, and how to set the machine so as not to excite suspicion in the animal designed to destroy. "Jack of all Trades" could, undoubtedly, "work out" anything from an improved dog collar to a new electric light. He could assist inventors with a fund of valuable advice, and, while they were prosecuting their arduous studies, could be relied upon for any necessary "jobbing," such as splitting wood, running errands, minding the baby, etc. If "J. of A. T." wants an apprentice, we know several of mature age that we would recommend.

Extracts from Chordal's Letters.

Messrs. Editors:

* * * * You honored one of my former letters by copiously extracting remarks relative to the length of time manufacturing establishments hold their places in this country. I often wonder if any one looks at "extention" in the same light that I do. By extension I do not refer to the legitimate outgrowth of a business, but rather to the uncalled for spread which elated manufacturers are prone to indulge in.

Can you not call to mind a dozen or a hundred men who, either alone, or in association with a single partner, have built up their business from nothing to a decided success, making money and decidedly prosperous? Follow them and ask yourselves is it wise? Shall we do as they do? Their course is too often after this manner. They find their business an unaccountable and overwhelming success. Their money is all invested, their room crowded, their energies and capacity fully taxed, *and they are making money.* So far so good. But with the expansive desire which leads on to ruin they look for outside capital, to admit into their own wee feathered nest. The modern stock company suggests itself. They form, incorporate, print stock, sell it, leave the old shop, move to some high-bidding town, build new and large, and strike out with a spoon entirely out of proportion to the sugar. The first election of officers puts the originators at the head of the course. Things prosper, and before another election the new stock-holders get some experience in the business rubbed off on to them by contact, and begin to have an idea or two. The new election changes affairs. One of the charter members finds himself out. Next election the other goes. They hold their stock of course and share the profits, but what are profits compared with the privilege of having a hand in the control of a business, whose creation and growth are due entirely to your own fostering care and years of labor?

The new management is often better than the old, but oftener worse; and the "original two" wish they were back in their old concern under the old firm name, with the blessed privilege of occupation in well-known channels.

I can mention a case in my own little State. Three men whom I will name after their respective trades, F, B and M, as Foundry-man, Blacksmith, and Machinst, combined their small capital and went into business with firm name as above. They all worked every day in the year, and they all grew rich. Notwithstanding the increase in wealth they still, through long years, gave their whole time to the business—not as workmen, of course, but as skilled business managers, for their years of successful experience had given them little ability as business men. Each had his department, production, finance, sales. From young mechanics they had grown to gray-headed business men, powers in their community, loved and respected by all. The legimate growth of their establishment, they were able to foster and father, and their prosperity was such as is due to unflagging attention and honest motive.

But the demon came, and taking them upon the pinacle of their highest chimney seductively charmed them with visions of further extension, extensions beyond their own means, but extensions warranted by the growing condition of the business. Say the word, and unlimited capital would aid them, and unlimited scope of action could be given to their concern. They hesitated and were lost. They said the word and the tempter himself took to the capital city the death warrant which made the F, B, and M Machine Company an incorporated concern, as provided for by the act, etc. The tempter brought back the document with the secretary's sign-manual and the States' great seal attached. This was the document destined to destroy the bonds which bound the three creators to their life's creation.

The certificates of stock, with a soaring eagle in the center flanked by portable engines and threshing machines, were engraved, engrossed and eagerly purchased by friends. At the election we find F President, B Secretary, and M Treasurer. They manage the business as usual and see no darkness. The business prospers and election day returns, and B finds himself an outside stock holder with profits and no duties. The new man becomes an honest element of dissension and makes honest trouble, so the stocks elect another president from without to aid him. There is less dissension now and a new election makes M vice-president with a salary of $3,000 and no duties. The by-laws gives him no voice in the management. His old colleagues are worse off than himself, but are stronger men and can stand it. All the old avenues of his life are closed, and he finds that he has not been working all these years for money but for occupation. That occupation is gone. He must not open his head on the premises of the incorporated company. He prays for duties and occupation and is told to have recourse to the elegant leisure of the rich.

The leopard cannot change his spots, nor can the working man of years throw off the active interested habits of a life. He tries to be an idle wealthy citizen and fails. He broods and tosses in his sleep during all his waking hours. One sunshiny day the incorporated company found the body of their vice-president in their pattern loft with a bullet through his brain, and in his private drawer in the safe they find this scrawl, "My usefulness and occupation in life is gone."

There are no such words in the act providing for the incorporation of stock companies under the laws of the State.

* * * * What's the matter with the screw companies that they can't make their products conform to the standard of the land? They find a standard ready made and accepted. Inaugurated by Whitworth, improved by Sellers, and perfected by the Engine Builders' Association. Still when you order screws you don't know what kind of heads they will have unless you specify. Their threads are all right and interchange nicely, but heads and nuts are liable to every possible variation. I got bolts from a concern and returned them on account of peculiarities. They explained by saying "It is *our* standard size." Nonsense! What is our standard is never likely to be a standard at all. The standard of sizes for boltheads and nuts has been well arranged, and when things are ordered without any mention made of size it should be understood that the accepted standard of the country is implied.

The screw makers are a god-send to the shops of the country, and a shop neglecting to avail itself of the economic advantages offered by buying good screws, at less than the cost of making bad ones, is short-sighted. But, nevertheless, the screw makers are not excusable in sending a thousand-and-one different sizes through the country. If a shop wants special heads they will so order, but if they don't, they expect the standard size. The common-sense machine designer now keeps his bolts as near uniform as possible, and sends solid wrenches to fit, and when he finds that the screw makers have mislaid their standard list, he wonders how these things can be. There is hardly a screw about an engine which cannot be bought from these men for about half their cost home-made, and they are far better in every way. The whole screw business has sprung up in the last fifteen years, and has not had to go through the experiences of the gas-pipe men to arrive at a mutual standard. They have the standard and will follow it if asked to, and therein lies the fault. They ought to do it without being asked. The way things are now, a three-quarter hex-headed screw, ordered from our concern, is an entirely different looking bird from a similar (?) screw ordered from another concern. Brace up, gentlemen, and print on your price-lists, "All bolt-heads or nuts, either rough or finished, are to Engine Builders Association standard list, unless otherwise ordered." If there is a screw factory in the United States without this list pasted in said factory's hat, I will send them one printed on satin, if they will have the kindness to send to you for it. Here's the formula on which the standard list is based:

Short diameter of hexagon or square nut, or bolt-head, equals once and a half the diameter of bolt, plus one-eighth of an inch.

Length of hex or square bolt-head equals one-half the short diameter of same.

Length of hex or square nut equals the diameter of the bolt.

These sizes apply to either rough or finished work. The idea of a black nut being larger than a bright one is bad, and founded on the mistaken supposition that a maker delivers a machine with half the work left for customer to finish. It's no trouble for shops to carry stocks of both rough and finished nuts. In fact, under the present screw price-lists, it would be folly to buy rough nuts to be finished in the shop.

* * * * By the way, there seems to be a lack of comprehension on the part of some as to the difference between a screw, a bolt, a stud, etc. This may seem doubtful, but it is true. Mr. Sweet published, some years ago, in *The American Artisan*, an illustrated list of the whole tribe, and, if I can find the thing, I propose to add a sample or two and coax you to publish it.

* * * * I made money by reorganizing my grindstone arrangements. I have been using three foot stones, running slowly in wooden frames, and have depended on most anybody in the shop to keep them true. By the way, did you ever notice that there was a charm in turning off a grindstone? It's so! This dirty job has positive attractions. The skillful manipulation of the "tool," the caution required, the constant muscular and mental strain, all make the job really unpleasantly pleasant after it is started. But about my grindstones. They were most always out of true; men put off grinding tools as long as possible, worked with dull tools, and, of course, did poor work and wasted lots of time. Let a man be working on a nice lathe job, the tool gets dull; he thinks of the awful grindstone, postpones grinding till he gets real mad, then does it and gets nervous and unfit for the work in hand.

I pro'd and conn'd over the thing this way:

These stones are out of true, because they gouge easily. They gouge easily because they run slow. They run slow for convenience in trueing up. They don't get trued up because the shaft is loose in the shackly frame. A quick running stone cuts fast and nice, and a slow running stone gets cut fast and awfully. I'll change the whole thing. I bought three solid metal frames, paid thirty dollars each for them; I think my old wooden ones have indirectly cost me a thousand dollars a piece. These frames are troughs, have heavy shafts, good solid boxes, convenient rests, a wonderful contrivance for holding a tank above them, and the whole establishment is on wheels.

I rigged a pulley out doors and run the stones out there at slow speed and had them turned up nicely. I, of course, had to go and turn one myself. Then I wheeled them back in the shop and run them at very high speed, and fixed pulleys so the speed could be increased as the stone got smaller. The frames had a self-trueing apparatus on them, which will true the stone while it runs wet at high speed, so I don't get any dust in the shop. I appointed Charley a committee of one to see that these stones were always true, not pretty near true, but perfectly true all the time, without regard to the number of stones used up in a year. He is also superintendent of the water works, and sees that no lathesmen have to run after water for these stones, or to grind dry.

Between you and me, those things were paid for in a month. The men work with sharp tools and neat tools; they pile great clean chips under the lathes and don't require one-quarter the tool-dressing they did before. Charley keeps the grindstone machinery swept nice and clean, and it is no longer the repulsive servant it used to be.

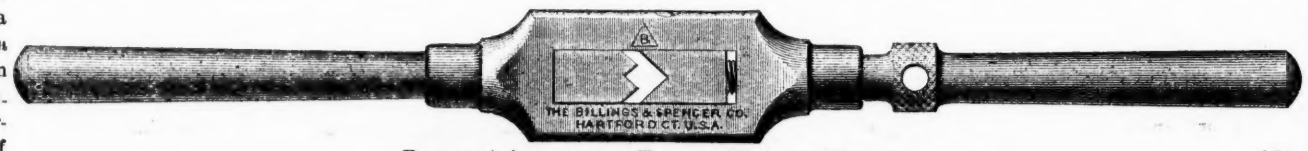
Very respectfully,

Chordal.

Billings' Adjustable Tap and Reamer Wrench.

A tap-wrench is an indispensable tool to all mechanics cutting interior threads by hand. The old and original method employed, was to have a number of wrenches, each with a different sized hole to correspond with the square of one of the several sizes of taps. Various devices have been brought out that would dispense with the large number of the old style of solid wrenches, but owing to the defective material made use of in their construction, the bulk and weight necessary to make them strong enough to stand the strain required (thus making a cumbersome and unhandy tool), they have not come into general use.

The tap-wrench herewith represented is drop-forged of mild bar-steel, and the dies are made of best tool-steel. The screw handle passes through the end of the stock, and enters a hole in the end of the movable die; a feather passes through the die and fastens it to the end of the screw handle. Grooves are cut in each side of the movable die, and two screws pass through the sides of the stock opposite each other, the points being fitted to, and entering the grooves in die. The movable die being attached to the screw handle, when the handle is turned the die moves back and forth. From the fact of its being forged from steel, makes this wrench, light, strong, and durable.



Billings' Adjustable Tap and Reamer Wrench.

They are manufactured by the Billings & Spencer Co., Hartford, Conn.

Publications Received.

Explosion of the Steamer Pat Cleburne. By John W. Hill of Hamilton, O. Member of American Society of Civil Engineers. Reprinted from Van Nostrand's Engineering Magazine for September, 1878.

This valuable artiele which is now published in pamphlet form reviews the various reasons that were assigned for the steamboat boiler explosion after its occurrence, and shows the fallacy of them all. It then points out the logically correct reason, and introduces some new ideas on the subject of explosions.

The Practical Brass and Iron Founders Guide. By James Larkin. Fifth Edition. Revised with Extensive Additions—$2.25. Henry Cary Baird & Co., Philadelphia.

This is a work treating exhaustively on the different alloys, their chemical and physical properties and the process of reduction. It gives very full information on the subject of ornamental casting. Correct instructions are given as to compounding metals for casting. The recipes for lacquers, etc. are very comprehensive. It is a practical work for the shop and has already met with great favor.

The "Allen" Riveting Machine has received the "*Silver Medal*" at the Paris Exposition, 1878, and is in operation at the following establishments: Messrs. J. B. & J. M. Cornell, New York; Mott Haven Iron Works, New York; Messrs B. W. Payne and Sons, Corning, N. Y.; Mr. John McLaren, Hoboken, N. J.; Messrs. Hewes & Phillips, Newark, N. J.; Messrs Griffith & Wedge, Zanesville, O.; Mr. R. Munroe, Pittsburg, Pa.; Mr. Wilhelm Rothe, Bernburg, Germany; Guttehofunugshütte, Oberhausen Ruhr, Germany; M. Taly, d' Argenteuil, Paris, France; Messrs Corpet & Boundon, Paris, France; French Government Dockyard, Port of Dorient, France; French Government Dockyard, Port of Cherbourg, France; Funderia Oretea, Palermo, Italy.

Inspection of Steam Boilers.

YONKERS, N. Y., Dec. 2, 1878.

Editors American Machinist.—The several recent disastrous steam-boiler explosions seem to have awakened a commendable discussion of the relative merits of the two methods of inspection, viz., the "hammer test" *vs.* the "hydrostatic test."

It has always seemed to the writer that all ordinances in relation to boiler inspection are defective; and it seems almost impossible to frame a law that will be effectual in every respect. Judging from the wording, it appears as if sometime in the remote past before much was known about steam or steam-boilers, or the strength of metals, some one drew up an ordinance in relation to steam-boiler inspection, so that most all subsequent ordinances are copies of the original one.

Take, for example, the law (passed April, 1862), under which the Municipal Police of New York city are operating. A careful reading will fail to discover a word about limiting the pressure on a given thickness of iron to a given diameter of shell.

Not a word about double or single riveting or bracing. Not a word about the quality of the metal or the workmanship. Not a word about the size of a good common safety valve, or of the appliances for supplying the boiler with water, nor of anything, in fact, that really concerns the safety of the boiler. And thus it stands, a "comedy of errors" it might be called, were it not such a serious matter; and thus it stands on the sole merit of the hydrostatic test, *without restriction.* We must always bear in mind that no law can be framed that will execute itself; and much of the efficiency will depend upon the inspectors.

The writer was called on at one time to assist in drawing an ordinance in relation to boiler inspecting; a few brief extracts may be of interest at this time:

* * * * The Mayor of the city shall nominate, and by and with the consent of the Common Council, appoint a *competent person* who shall be a practical machinist and engineer of at least five years' practice and experience, and fully acquainted with the theory and practice of steam, to be inspector of boilers and examiner of engineers.

* * * * It shall be the duty of said inspector to examine all persons proposing to operate, manage or run steam engines or boilers within said city, and to certify the qualifications of such as he shall find competent, and to license such persons to operate, manage; and run steam engines or boilers in said city.

* * * * The said inspector shall annually, and at such times as licenses shall expire, inspect all steam boilers set up or to be set up, used or to be used, in said city, and all appliances connected therewith, and test the same. He shall so do at such times as shall interfere as little as possible with the business connected with the use of steam generated in such boilers. He shall give at least ten days notice of the day and hour of day when he will make such inspection and test, by notice in writing to be delivered to any person found in charge of any such boiler. In making such inspection and testing, he shall proceed to inspect such boiler or boilers and all attachments and appliances connected therewith. The strength and security of such boilers shall be tested by hydrostatic pressure, and he shall limit the pressure of steam to be applied to or upon such boilers, respectively. In limiting the amount of pressure whenever the boiler under test will bear the same, the limit desired by the owner shall be allowed and licensed by the inspector.

* * * * The hydrostatic pressure applied by such inspector in testing any steam boiler shall in no case exceed the limit of elasticity of the iron of which made. When the elasticity of the iron of which the boiler is made shall have been ascertained by the officers of the United States government, and is known, such shall be the assumed strength of the iron; when not so ascertained and known the limit and elasticity assumed shall not exceed 9,220 pounds of pressure per square inch of section when double riveted by machine, or 8,925 pounds per square inch when double riveted by hand, and 8,180 pounds per square inch when single riveted.

No person shall subject or permit any other person to subject any boiler to a higher steam pressure than that specified for its use in the license to be issued, which shall in no case exceed 75 per cent. of the hydrostatic pressure applied on the inspection.

No steam boiler shall be used in said city which shall not have a safety valve of sufficient area to carry off steam as fast as generated, and attached thereto an escape pipe of like area leading direct to the open atmosphere. No boiler shall be used in said city which shall not have some sufficient and appropriate appliance for supplying it with water when the engine is not in operation. No boiler shall be used in said city which shall not have three or more gauge cocks, also a glass water gauge all properly affixed in the proper place, and in good working order. No person shall use or cause to be used, or permit to be used, any steam boiler in said city not so provided, and no person shall load, lock or hamper the safety valve of any boiler so that steam applied to the limit of pressure will not freely escape therefrom.

In case any steam boiler or the appliances or apparatus connected therewith shall be deemed by said inspector, after inspection to be insecure or dangerous, he shall prescribe in writing to the owner such changes and alterations as may render such boilers, apparatus and appliances secure and devoid of danger, and in the meanwhile, and until such changes and alterations are made and such appliances attached, such boiler, apparatus and appliances may be taken under his control, and all persons are hereby prohibited from using the same.

It would seem as if with the power to examine and license competent men as engineers, as well as to inspect boilers, all placed in one responsible head, it would be an easy matter to get all the benefit of thorough inspection; yet we will venture to say there is no city in this country where boiler inspection and the examination of engineers is more of a farce than in the city to which this ordinance refers; thanks to the Mayor.

Council who were for political considerations induced to appoint as inspector a person who is in every respect unqualified for the office. This shows us how little effect the law has.

Suppose the Hartford Insurance Co had no control over the inspectors they employ, and they should conclude that going to the boiler room and shaking their hammers at a nest of boilers was sufficient, and just after doing so, one or more of the boilers should explode, would that prove the hammer test to be defective in principle? We think not; and so with the hydrostatic test; it is the abuse, and not the use, of the method that should receive our condemnation.

If any one thing above all others should be understood at this day, it is that the iron of which a boiler is constructed is like all other iron, in that as soon as it is strained beyond the limit of elasticity, it is permanently injured, and if the practice is continued, a time will surely come when it will give way under a pressure which at one time was only about one-third its bursting strain.

Mr. Payne seems to have struck the key-note when he says (in effect) that working boilers within a few pounds of the collapsing pressure is a very dangerous practice, and he may be assured that if the writer has occasion to travel in the vicinity of Cincinnati, he will most assuredly travel by rail after receiving this warning.

But to return to Mr. Allen's comparison, we cannot agree with him that it "shows conclusively the relative merits of the two kinds of inspection."

If we understand the matter, the comparison is made between two classes of boilers rather than between two methods of inspection, the one a large and expensive boiler, subject to all the destructive influences that surround Marine boilers, the other a comparatively inexpensive boiler, protected by influences that conduce to exemption from destructive explosion.

As it would be monstrous for Congress to enact a law compelling every owner of a boiler to have it inspected and insured in the Hartford Co., we cannot look for protection in that direction. The question is, what shall we do about it?

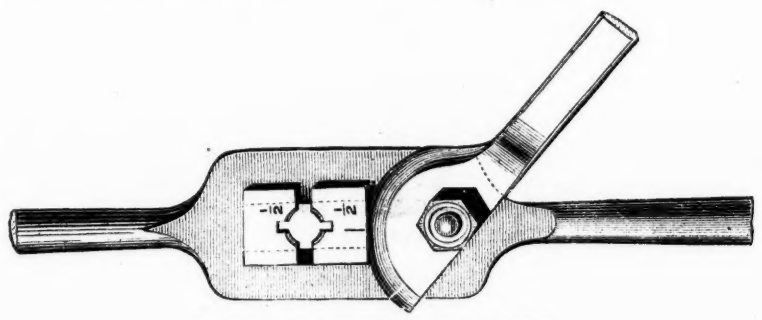
Why not insist that the valuable features of both hammer and hydrostatic test shall be employed, and that inspectors shall be appointed solely on merit, and not through chicanery, for, after all, efficacy of inspection will depend in a large measure on the inspector.

W. H. ODELL.

Everitt's Patent Stocks and Dies.

The engraving represents an English tool just patented here, and destined, from its extreme simplicity and usefulness, to command a large share of the market in these articles. Unlike all other adjustable dies, these are self-contained, requiring no lever, wrench, or screw-driver, to alter the size of the cut. This is effected by using a cam attached to the stock, as shown, to feed up the upper die, instead of a set-screw or the handle of the stock. By this means a man can see at a glance when he is cutting standard size or larger or smaller; a mark being put on the cam and die, which, becoming coincident, shows that the bolt is cut to the proper size; taking the mark on the cam past that on the die, the bolt is cut smaller, and *vice versa;* stopping the feed short of the mark, the bolt is left larger. When a cut has been made down a bolt, instead of wasting time by unwinding the stock, and, perhaps, partially spoiling the thread, the dies can be instantly released from their work by throwing the cam-lever back, when the stock can then be lifted off.

Changing the dies is effected instantly, by turning the cam-lever round, so that the flat part is opposite the lap-die, leaving space for the dies to drop out.



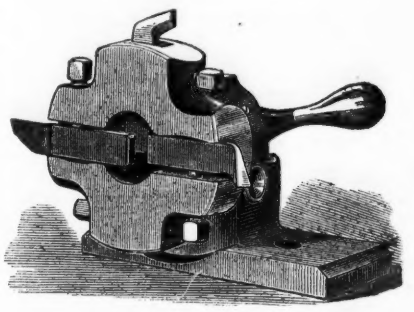
EVERILL'S PATENT STOCKS AND DIES.

In all the forms of adjustable dies at present in the market, there is no means of telling to what size they are set without trying them, and to do so requires they should be opened out to their fullest extent to prevent the possibility of cutting too small. If a large number of bolts were to be cut to the same size, this would not be such a great objection, but the fact is, as every mechanic knows, these hand tools are not used to make stock bolts, but are required to cut odd sizes to fit a particular nut or hole. Being able to do this with absolute certainty is a very important feature in Everitt's invention.

In solid dies, which close (to take up the wear) by means of screws, it is a troublesome matter to take the dies from the bolt, and with an extraneous tool, like a screw-driver, to alter them for adjustment.

We are obliged to Mr. Harry Olrich, of 111 Broadway, who has come over from England chiefly on this business, for this opportunity of noticing an English invention rivaling in simplicity some of our American efforts.

The Buckeye Engine Co. have been working their full force over-time for several months, and still continue full of orders. They are building a pair of direct connected engines, dispensing with all belts and gears, for the Merrimack Manufacturing Co., Lowell, Mass., 24 "x 36" cylinders. These engines are coupled at right angles, and are to run at 160 revolutions per minute. Each cylinder is to develop 500 horse power. Besides the above, they are building some 12 engines of various sizes for customers from Gardner, Me., to Galveston, Texas. They are also building new cylinders and valve gear complete for a pair of 22" x 48" engines for the Hartford Carpet Co., Thompsonville, Conn., and for a 24" x 48" engine, for the New Haven Rolling Mill.



Richards' Revolving Tool Holder for Engine Lathes.

This is a tool calculated for turning out work when many pieces of the same size and form are wanted, as it will hold all the tools required to finish the work without changing.

By this arrangement a tool is set for each size, or shape required, and, after having used the first tool for its work, the next one is brought up for use, and so on until the work is finished, without removing it from the lathe, thereby saving much time, and finishing the work more uniformly.

It will be found very convenient for chuck work, working up close to the face plate, &c., without requiring any tools, set off, or bent. The holder shown in the cut is 5 inches diameter, and holds 4 tools of $\frac{7}{8}$x$\frac{3}{4}$ inches steel, from 3 to 4 inches long, and is suitable for lathes from 14 to 18 inches swing. The stands are made for either gibbed, or weight rests, as desired.

The tools are made from the bar as usual, only of smaller steel, and shorter, so as to give solidity and strength without being in the way of the workman. Each tool is raised or lowered independent of the others by screws (not shown) on the side of the head.

The construction and operation are very simple, requiring less than one second to change from one cut, or tool to another, and without any complications to get out of order. For further information address the patentee and manufacturer, I. P. Richards, Providence, R. I.

Personal.

Mr. George H. Corliss has received numerous inquiries from Water-Works Boards in regard to his remarkable pumping-engine. The question of a more economical water supply is attracting wide attention. *The Engineer*, of London, has applied for the cuts shown in the supplement to our October number, and will present them in a future issue with the unexampled results of the contract trial as published in the AMERICAN MACHINIST.

Mr. B. T. Babbitt, the great soap manufacturer, has invented a rotary steam engine upon which he has secured several patents. Now, rotary engines, as a class, are more ornamental than useful—in a practical and economical way—but Mr. Babbitt has produced one that develops extraordinary power with a small steam supply. We saw one, 4 inches diameter, running 20,000 revolutions a minute, with steam supplied by an $\frac{1}{8}$-inch pipe. This little motor defied the efforts of some very heavy men to stop it, by bearing upon a good lever with the best force each could muster. He will arrange one of these engines to drive two blowers, one on each side, both of them to run without journals.

Mr. W. H. Warren, of Worcester, designer and manufacturer of special machinery, has had a severe attack of pneumonia. He has been sick for about four weeks, but, we are pleased to hear, is now recovering.

Mr. John Kelly, for several months in charge of the New York warehouse of the National Steam Pump, has given up the New York office and will hereafter be found at the works, New Brunswick, N. J.

AMERICAN MACHINIST

PUBLISHED MONTHLY

BY

MILLER & BAILEY,

Editors and Proprietors,

75 Fulton Street, New York.

H. B. MILLER. JACKSON BAILEY

Edition, 7,200 Copies.

The Trade supplied by The American News Company and Branches.

SUBSCRIPTION.

$1.00 per year, in advance, United States Postage prepaid.

To Foreign Countries, $1.00, postage added.

ADVERTISING.

Outside page, 35c. per line, each insertion.

Inside pages, 20c. per line, (12 lines one inch.)

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☞ *We are not engaged in procuring patent rights, or in selling machinery; nor have we any pet scheme to advance, or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers, inventors, draughtsmen, and all those specially interested in the occupations we represent, on subjects pertaining to machinery.*

NEW YORK, DEC. 16, 1878.

Does the Increasing Use of Machinery Depress the Condition of the Working Classes?

A comfortable and contented condition of its working people is the best evidence of a nation's prosperity, for labor is the creator of all real wealth, and can not suffer without involving the whole body politic. When labor can not find full employment, many reasons for it are offered, and it is not strange that some of them are positively erroneous, and when strongly urged, exert a mischievous influence. The opposition to labor-saving machinery seems to have developed itself more boldly within two or three years than ever before, and it is important to inquire whether this opposition is based upon any good foundation. Almost every one of the material necessities and luxuries of life is in some measure dependent upon machinery for its production. If the use of machinery were to be curtailed, many precious comforts and conveniences which the laboring man now enjoys would be so enhanced in cost as to be beyond the reach of his limited means. The increasing use of machinery is constantly bringing new objects of gratification, heretofore too expensive to be within the ability of the workman to possess. His home is better furnished, and all his surroundings betoken more luxury and refinement than they did twenty or thirty years ago when machinery had not come into such universal use. It may be urged, that machinery has so enlarged production as to supply the masses of people with all the goods of every kind that they require with the labor of half the hands dependent upon wages. If the intelligent portion of mankind were satisfied with the same quantity and quality of possessions as they were when our grandfathers were boys, this might be true, but the world moves, and people of this progressive age of steam and electricity demand much more and better things than did the toilers in the era of stage-coaches and post-riders. Our wants for the products of industry increase in proportion to our ability to supply them, and the more machinery enables men to produce the greater will be the consumption of each individual. But what effect has machinery upon wages? Comparing the different countries of the world, we find that wherever machinery is used to the greatest extent, for example, in America, England, and France, labor commands the best wages, and enjoys the greatest liberty and prosperity; while in countries where machinery is almost excluded, as in China and India, the working people obtain the poorest pittance, and exist in the most abject condition. The use of machinery has always kept pace with the march of civilization and national wealth. It has elevated the laborer from a plodding drudge to a higher and nobler level; instead of straining his own muscles by onerous exertion, he directs the forces of nature, and produces a hundred fold greater results without wearing out his physical strength.

The use of machinery tends to lessen the hours of labor as well as to ease its burdens. Not many years ago, twelve hours constituted a day's work for mechanics and artisans; but with the advantages afforded by the march of mechanical improvement it was shortened by two hours, and we confidently anticipate, in the not far distant future, that throughout this great progressive nation, *eight hours* will be fixed upon, *by mutual consent* of employer and employed, as the limit of a mechanic's day's labor. This step in advance can not be achieved by National or State legislation, but by the use of machinery that will enable the workman to accomplish in eight hours what has hitherto required ten hours. It is not too much to expect that the American workman will in time be able under an eight-hour system to supply his wants even better than at present, at the same time producing goods to compete abroad with the industries of other countries. The only way the industries of the United States can successfully secure and hold foreign markets and give laborers steady and remunerative employment, is to use labor-saving machinery to the greatest possible extent. Thus, machinery, instead of being the workman's enemy, is his best friend; instead of causing dull times, it will be found the greatest helper in bringing back active business and overcoming hard times.

British vs. American Workmen.

In a recent issue of *The English Mechanic*, appears the following letter from a manufacturer explaining very pointedly wherein the British workman allows himself to be outstripped by his American cousin. As the letter was not written to compliment the mechanics of our own country, but to benefit those of England, the facts it presents will be all the more appreciated:

"The British workman having, as a rule, no general training or knowledge worth the name, seems almost unable to get out of the groove in which his ancestors ran. For the last ten years, in anything requiring judgment on the part of the workman, I have found it far less trouble to make the things with my own hands than to give a workman instructions which, in many cases, he will not follow, because he does not understand nor does he care to learn the 'reason why' of anything. Many tools in common use have serious faults and are not properly adapted for their work. When I have applied to the makers, showing them the faults and asking for modifications, irrespective of price, I am met on all sides by a refusal to entertain the idea, the invariable reason being that the workmen will not go out of their regular groove. I have, in many cases, sent rough sketches of modified tools to America which I have totally failed to get made in England, at any price, and have afterwards been able to buy the very things of American manufacture in English tool shops. I know of cases where English tool makers have been obliged to buy American-made tools to do their work—tools which English workmen would not or could not copy.

"'The proof of the pudding is the eating.' I have at this moment at least three-fourths of my tools of American manufacture, many of which have been bought at a very fancy price. If it were not an absolute necessity, I should be exceedingly foolish to buy American tools at a high price, if English tools were to be bought which would do the work equally well. From my own practical experience the difference between the two is that an English workman does not, in the first instance, learn what a tool is for, and adapt the tool to the requirements; an American workman will, as a rule, use his brains, and make what you want without spoiling the whole by ridiculous blunders. The Americans are fully capable of making rubbish, but they are not alone on this point; many English things are simply made to sell but, certainly, if I needed a thing, making which, regular judgment on the part of the workman, and I could not give personal and constant supervision, I should, as the simplest way to get the thing right, send the instructions to America.

"The English employer is, as a rule, a man of sound knowledge and fully capable of undertaking in his own department, except in the matter of getting his workmen to do what he requires with judgment; the man is a machine, not expecting to have to use his brains, and the few workmen who do use their brains are so very rare and valuable that the effect on the mass of workmen and work is exceedingly small, gradually becoming *nil*, as those men usually become masters, and, in their turn, have to exert their energies, not to work, but on the British workman. The first thing to be done is to give apprentices not the present rule-of-thumb education, but start them with a training purely technical, and combine this with practical work; one is of little use without the other."

Whatever may be said in favor of a technical training as a reinforcement to the practical (and we hold that it is highly desirable), it does not explain the superior progressiveness of the American mechanic. The difference is owing to the wide divergence of our political and social system from that of Great Britain. The system under which the English workman is born and educated, recognizes all subjects of the crown only as settled members of distinct social classes. The ethics of caste does not permit the nobility, the gentry, the trades-people, and the work-people, to mingle upon the same plane. A workman is regarded as belonging to the lowest caste. If he tries to rise above his sphere, or materially better his condition, he is looked upon as an "upstart," or a pretender. Centuries of enforcing this odious class restriction have chained him down with fetters he can scarcely hope to break. In his country, a gentleman is one "to the manor born," who has a landed estate, and whose chief occupation is to drink wine, bet on horse races, and hunt foxes with a pack of hounds. In America, a gentleman is a man of intelligence, gentle manners, sobriety and culture, be he workman or millionaire. Both our social and political institutions permit and encourage a workman to rise to a higher level, making use of every opportunity within his reach. He is estimated according to his own merits, not according to the wealth and position of his ancestors. If he changes his occupation, his friends and acquaintances do not turn their backs upon him as a profligate, but accord him the same good-will as before the change. The British workman is held in check by the Free Trade system which conduces to make men mere automatic machines, and to give their life-long labor for the lowest possible pittance that will support them, in order to produce goods cheap, and enable their employers to undersell foreign competitors while making good profits. Lately, however, the efficiency of this system seems to be badly shaken by the more rapid advance of our mechanical progress, and the advantage it gives us in foreign markets. For the American workman, Protection has raised up a barrier against the unrestricted competition of foreign ill-paid drudges.

A large portion of the proprietors of our great manufacturing establishments have risen from workers for wages to extensive employers of workmen. Not so in England; few artisans in that country, starting at the lower round of the ladder, ever approach the top. When the English workman emigrates to America he discloses original mechanical abilities (unless he is too old to change) that take rank with native Yankee genius. Once free from a subversive system of social and political economy, he will rise to his proper level. In the old country, if he devises an improvement in his working tools the benefit generally accrues to his employer, for the cost of taking out and maintaining a patent is far too high to be within reach of the average workman. Is it any wonder the English mechanic does not keep pace with American inventive operations? Is it strange that they are sorely troubled with prolonged and often malignant strikes on the other side of the Atlantic? The American workman can thank Providence that his lot is cast where there are no privileged classes, where the prevailing sentiment of the whole community is in his favor, and where he can secure a just reward for industry, enterprise and ability.

A New Industry in California.

"This column," says the *San Francisco News Letter*, "is rarely devoted to advertising business or puffing individuals; but it seems only due to the parties concerned to announce that four recently discharged prisoners from San Quentin, two of whom are brothers, who have hitherto been considered hard cases, have just opened a store on the City Front, and are trying to earn an honest livelihood.

The name of the firm is Sykes, Biffern, Slogg & Co., and they have commenced the manufacture of brass knuckles, sand clubs, slung shot, and jimmies, on quite a large scale. The industry is one that has long needed developing in this city, and when more generally known, will doubtless obtain for itself the patronage of our best burglars and qualified garroters. This thing of sending to New York for a reliable bit and brace is altogether played out, and we earnestly commend the above local industry to the attention of our home desperadoes who are being pardoned out in sufficient numbers to make them quite an effective portion of this community during the long dark winter evenings."

We commend this bit of information to the State Prison Inspectors of the State of New York. There may be reason to apprehend a formidable rivalry from California to the manufacture of improved burglars tools so long and so successfully carried on in this city by the gentlemen comprising the Tenth Avenue Gang and other well known associations. The most effectual way to head off such rivalry, is to see that there is no lack of thoroughness in the mechanical instruction afforded the students at those extensive institutions of learning, conducted under the tutelage of the State at Sing Sing, Auburn, and Clinton. We learn that considerable progress has lately been made in these great hives of industrial training by the introduction of improved tools, machines, and apparatus for affording the learners a more skillful knowledge of mechanics, thereby rendering them more than a match for the manufacturers of safes, combination locks, and vault doors. The effect may be observed in such well-executed jobs as the robbery of the Manhattan Bank. With a continuance of the careful mechanical education adopted at our State prisons, jobs of this kind will not be rare.

In the Cincinnati Commercial of Nov. 18th, appears in full, a plain and valuable paper on "The Application of Electricity to the Arts," which was read by James W. See, of Hamilton, O., before the Electrical Society of the Ohio Valley. Mr. See possesses the rare faculty of making deep scientific matters plain and intelligible to persons unacquainted with technical terms. The paper here referred to is one of the most clear, interesting and progressive explanations of the application of electricity to practical use that has ever come under our notice. We regret that the limits of our space will not admit of our reproducing it.

In our next issue we shall begin a series of articles on the Steam Engine, by Stephen Roper; also a series of articles on engineering subjects, by another well-qualified author. We have in preparation some important new features which will render the American Machinist of increasing value to those directly interested in the practical operations of the shop.

Our columns are always open to communications on practical machinery subjects. Write plainly, only on one side of the paper, and be sure that some new ideas are presented with which machinists are not generally familiar. We intend our columns to be a current record of mechanical progress.

Grinding and Polishing Metal Surfaces by Hand.

BY THOS. HAGERTY, M. E.

There is no job the worker in metal is called on to do that requires the exercise of his brain and muscle in the proper direction than the grinding and polishing of metal surfaces on that class of work where machinery cannot aid him. The more he exercises his brain, the more saving he will be of both his time and muscle. The practice generally employed by machinists in grinding and polishing either new or old work was to mix the polishing material with oil, usually refuse machinery oil; in most cases this is a great mistake, and has caused the loss of time, patience and money. Take for instance the grinding to a true bearing of a stop cock, a valve, seat, or a slide valve. There are few machinists but what have had more or less of that class of work to do, particularly in jobbing shops, and we seldom find one who uses the same method of accomplishing the job that is practiced in shops where that class of work is made a specialty. In fitting and grinding in the plug into the barrel of a cock a little judgment and care will save a great deal of hard labor, and in no case should oil be mixed with any of the grinding material, for the following reasons: If fine emery, ground glass or sand are used with oil, it requires but a few turns of the plug in the barrel to break up the grains of the grinding material into very fine particles; the metal surfaces also grind off; the fine particles of metal mixing in with the grinding material and oil making a thick paste of the mass. At this stage it is impossible to grind or bring the metal surfaces to a bearing, as the gluey paste keeps the metal apart; if more grinding stuff is applied it will prevent the operator from seeing what part of the barrel and plug bears the hardest. Again, if the grinding material be distributed over the whole surface, the parts that do not bear will grind off as fast as the parts that touch hard, as the particles work freely between the surfaces; should the barrel and plug bear equal all over when fitted it requires more care than if it were a top or bottom bearing, as that part of the barrel and plug across the "waterway" grinds twice as fast as the other parts, therefore, it should be kept the dryest. Now this objection holds good in the grinding of valve seats or slide valves, to wit: the separation of the surfaces of the metal by a thick, pasty grinding material. In order to bring the surfaces to a perfect bearing rapidly and with little labor the following directions will be found worth a trial:

To grind a stop cock of any kind, first see that the plug fits the barrel before it is taken from the lathe. Run a half-round smooth file up and down the barrel to break any rings that may be in it; a few rubs of a smooth file back and forth over the plug will break any rings or tool marks on it. Wipe both parts clean. Use for grinding material fine molder's sand sifted through a fine sieve. Mix with *water* in a cup, and apply a small quantity to the parts that bear the hardest. Turn rapidly, pressing gently every few turns; if the work is large and the lathe is used run slow; press and pull back rapidly to prevent sticking and ringing; apply grinding sand and water until a bearing shows on another part, then use no more new sand, but spread the old that has worked out over the whole surface. Turn rapidly, pressing gently while turning; withdraw the plug and wipe part of the dirt off and rub on the place a little brown soap; moisten with water and press the surfaces together with all the force at hand, turning at the same time. Remove the plug and wipe both parts clean; next try the condition of the bearing by pressing the dry surfaces together with great force. If the parts have been kept together closely while grinding, and the plug has not rubbed against the lower part of the barrel, the surfaces will be found bright all over and a perfect bearing obtained. If an iron barrel and brass plug are used, or two kinds of brass, a hard and soft metal, soap should be used freely when finishing up, as the tendency to form rings is greater when two different metals are used.

In grinding a slide valve which has been in use until hollow places have worn in the surface, emery mixed with water, or sand and water, will be found better than oil, unless a light body oil such as kerosene is used. If water is used with the grinding material soap should be rubbed on hollow places, and the grinding stuff should be applied to the high parts in small quantities, keeping the low parts clean and dry until an even surface is obtained all over; then the worn out stuff should be used for finishing up. In polishing metal, oil that will "gum up" should not be used with the polishing material unless for a dead fine polish. In polishing old brass work which has been scratched and tarnished by wear, pumice stone or bath brick should be used with soap and water for scouring off with, and rotten stone with kerosene oil for the wet finish, and dry for the final polish The same method should be used for new brass work.

New work should require when leaving the lathe and vice tools but little polishing or grinding, and every good workman should try to avoid using an emery stick or emery cloth, as with proper care in the use of tools a great deal of grinding and polishing can be dispensed with.

Business Specials.

Thirty cents a line for each insertion under this head.

The Pratt & Whitney Co., of Hartford, Conn., make a specialty of Cutters for the teeth of gear wheels, that are shaped entirely by machinery and will make interchangeable all gears that are cut with cutters of the same pitch.

For Drop-Forging, Packer Ratchet Drills, Lathe Dogs, Screw Plates and Dies, Address The Billings & Spencer Co., Hartford, Conn.

Frasse & Co., 62 Chatham Street, N. Y. have the most complete assortment of Machine Screw Taps for Machinists, Gunsmiths, Sewing Machine Manufacturers and others, of any house in this country. Also a full line of Chucks, Twist Drills and Fine Tools of every description.

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Wanted—The address of the manufacturer of a Spiral Screw Driver, such as was exhibited at the Centennial. Address S. B. C., care of AMERICAN MACHINIST.

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Latest and best Books on Steam Engineering. Send stamp for Catalogue. F. Keppy, Bridgeport, Ct.

Inspection of Boilers and Engineers.

Messrs. Editors:—

Your Cincinnati corespondent, who criticised the U. S. Government system for "Marine Boiler Tests," may not have been present at the gathering of those honorable "steamboat owners in Louisville," who concocted measures to induce the Hon. Secretary of the Treasury to postpone the enforcement of the "law" he refers to, by which "passengers may be protected." He well exclaims: "Providence help the passengers, on steamboats and ferry-boats, leaving that city daily, the boilers of which are not properly tested!"

The "Steamboat Law" was passed Feb. 28, 1871, and in August of that year the Supervising Inspector of this district, in his circular to the local inspectors, says, that "on commencing (?) the performance of your duties under the new (?) law, let me urge upon you the utmost vigilance, that the public may not be disappointed in their expectations of traveling with greater safety hereafter on vessels propelled by steam." This was very well for a flourish. It is worthy of remark that all tug boats and tow boats which carry the highest pressure (often 150 lbs. per inch) had been, and now are, exempted from the use of registering (or recording) gauges, by the action of the Board who passed a "Rule" to that effect *in violation of the spirit of the said law*, which, as its heading expressly says, is "*for the better protection of life and property* upon *all vessels* propelled either wholly or in part by steam." It is astonishing that the public endure so signal an outrage, and that the Secretary of the U. S. Treasury should countenance, even unwittingly, by "approving," such unblushing infidelity to the public safety and the majesty of a legal enactment, which they themselves had been several years considering before its passage. How farcical and trifling such conduct; yes, if not in reality criminal, *in view of the humanitarian features of the said law!*

The announcement was made in the Washington *Chronicle* of June 28, 1871, to the effect that it was understood that out of regard to steamboat owners, they would not be required to equip their steamers with the several appliances then recently adopted for securing safety to life until the January then following (!), being eleven months after the date of the said law.

It is also worthy of remark that the Inspectors had, for months, been *drawing their pay* at the *increased rates. No delay in that.* The Supervising Inspector-General and the Supervising Inspector of this district were appealed to, to *permit no delay in the application to use on boa d of steamers the "Recording and Alarm Gauges," and other appliances, they having been duly adopted months previously;* and *not to wait till "another sad disaster" should be chronicled and hundreds of lives be lost, as had generally been the case before acting in such matters.* The writer was assured that they should, and would, see that those instruments *"were at once put upon steamers."* The boiler of the ferry-boat "Westfield" exploded July 30, 1871, (a month and two days after the aforesaid promise to the writer was made) whereby more than one hundred lives were lost, and which disaster assuredly could not have occurred had she been supplied with a *Recording* gauge, whereby an "alarm gong" would have given *timely notice of an excess of steam pressure,* and enabled passengers to see that a check was applied, or to have gone ashore, if necessary, and thereby have saved their own lives! Strange as it may seem, and inconsistent as it may be, the said ferry-boat was not then, nor has she since been, equipped with the Safety Gauge, referred to.

The question arises, How long shall a confiding public be compelled, unwittingly, to assume the great risk they incur, when passing over the route of said steamer, as well as of other routes where the law is similarly ignored? The cabins of the "Fulton" and "Farragut" were provided with them, but the U. S. Inspectors soon permitted the law (which said they should be "conspicuously placed" where passengers and others could witness their working) to be trampled upon, by allowing the gauges to be removed to the hold of those vessels—a place out of reach, and which no one is expected to visit! They were consequently neglected and were finally removed.

In regard to the question, Whether the Government inspection is a failure, or not, I remark that it is utterly impossible for any system of inspection, either of engineers or boilers, to attain perfect thoroughness until it recognizes the value and avails itself of the unimpeachable and exact data only obtainable from and by the proper use of "Recording Gauges." I say the "proper use" in accordance with the certificate of Mr. J. Scott Russell, the eminent English engineer. He writes that the educated and intelligent owners and workers, who have the right to know what has been done by the steam itself, as well as by those in re-ponsible charge of it, will, doubtless, make *proper use* of this exquisite mechanism, etc The comparison, in your last issue, of lives lost from boiler explosions cannot hold good, as marine boilers are far more exposed to injury than those on land, and which are in the care of the Insurance Company referred to, which, doubtless, takes but few risks upon defective boilers.

It can hardly be expected by an intelligent person that even a tolerable degree of perfection will be attained until the "Steamboat Law" shall be completely revised by a competent *legal committee,* acting by and with advice of a *duly appointed associate committee* from the *U. S. Navy Department.* Such Revising Board should be not only competent for those peculiar duties, but be free from political influence, and none of whom should be directly, or indirectly, interested pecuniarily in any vessel propelled wholly or in part by steam. And no "rule" or "regulation" made in carrying out the enactment so framed should be permitted which may have the effect to nullify or be subversive of the true intent of such laws.

An "investigation" would, doubtless, show that the "Mercury Gauge," which the Board adopted as the test instrument, has been for months (during the last Summer at least) out of order; hence, there could not have been *a correct test applied to any steam gauge in this important district!* If it was true, as stated by Captain Low, in the said circular, that the New York ferry-boats "carried more people than are carried by all other public conveyances in the United States put together," and that "their engineers cannot exercise that supervision over them that is required," "and that it cannot reasonably be expected that the Inspectors can spare the time (?) to give them the attention that ought to be bestowed on them," etc., then, there can be no excuse for exempting these and other passenger-carrying steamers, including also tug and tow-boats, and steam yachts, from equipping with the "Recording and Alarm Gauges," which were adopted also by the commissioners appointed for testing boilers, as the *standard instruments,* for precision for indicating and recording pressure of steam, from zero to twelve hundred pounds per square inch!

The U. S. Centennial Commissioners borrowed those instruments for their critical tests, and certified to their great value and their accuracy, as shown in the following extract from their "Official Report" upon "Group XX," to wit: "In this instrument the variations of pressure are recorded on a ribbon of paper, kept in motion by an excellent clock movement, and are indicated also by a hand on a dial in the usual way. The tripping-post of the "Mechanical Alarm provides a means whereby an electric current may be closed" (and an alarm gong be rung in the engine or boiler room), "whenever the steam pressure shall exceed any given limit, which is *valuable as a precautionary measure,* and the records are secured" (when required) "by lock and key," etc. "*The gauge is valuable to show the attention paid by watchmen, firemen, and other employees to their duties, either day or night, or both,* and the records may be made the basis of Instructions to secure economies in management. Their reliability and accuracy were satisfactorily shown during the boiler trials made by a committee of the group."

The venerable Horatio Allen, chairman of Group XX, reported that "the manner of conducting the trials and *recording the facts,*" was of "*the most reliable character.*"

Sir William Fairbairn, Bart, Manchester, England, whom your correspondent quotes, assured the writer of his high appreciation of these recording steam gauges, and promised his influence as president of a "Mutual Boiler Inspection and Insurance Company" in England, in procuring their adoption and use, feeling confident that by reference to the written charts or records daily, steam users could be enabled *intelligently to criticise the performance of assumed duties by their subordinates,* and themselves reap mutual benefit in *reduced risks of "explosions," and other damage resulting from ignorance or recklessness.* With fair-minded men no argument should be required in order to convince them that no difficulty can be experienced in judging of the capacity or trustworthiness of boilers, or of those in charge where these gauges are used, and the written records daily referred to, and duly criticised.

In such cases as the "Adelphi," the "Brilliant," the "Westfield," and other disasters, it is much to be regretted that owners of "excursion steamers," as wel as other "floating palaces," are permitted to receive citizens on board without their owners surrounding them with every well-known appliance for securing their personal safety, whether the "law" required their use or not. It is to be feared, however, that there will be found in the Halls of Congress, and in the adjuncts to the Treasury department, sufficient influence to pass what is popularly called "The Steamboat Bill," amended by and to suit, not the public, but those who, like "the *master and the owner of the ship,*" referred to by the Apostle Paul, pretend to *believe there is no danger,* but who are too often, now, as then, found "fleeing in the boats," and as in a recent case, "pushing back even the women and children" from them.

Inasmuch as these instruments are in use on board of the steamers of the Russian, as well as the Austrian and English navies, and many lines of foreign ocean steamers, as well as some of our own merchant and passenger-carrying steamers, it is hardly possible of belief that an intelligent body of men can permit said "Bill" to become a law until sure provision shall be made therein, which shall secure the placing of these *exceptional safeguards to human life,* upon every vessel inspected under the provisions of said law.

Truly yours,

M. B. EDSON.

New York, Dec., 1878.

Questions and Answers.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly and according to common sense methods.

(1) N. A. H. Keene, N. H., writes, Can you let me know by what process hooks, eyes, eyelets, etc., are given that glossy, flexible black coating which does not peel off (like japanning) when bent or compressed? A. We are not aware that the process is employed in this country, but a mechanic from Germany, where it is much practiced, gives us the following: Place the articles in a closely-covered iron pot, or a muffle, with a lot of small pieces of beech, or of any wood that abounds in creosote. Heat until the wood becomes slightly charred, so as to deposit smoke on the articles. Agitate the mass so the deposit will be uniform.

(2) N. R., Columbus, O., asks if there is anything that will make leather stick to iron. A. Melt together in an iron vessel two parts by weight of common pitch with one part of gutta percha.

(3) J. W. Easton, Pa., asks what will be the chordial pitch of a pinion 8 inches in diameter, and to contain 12 teeth? 360° ÷ 12 (No. of teeth), = 30°; take half = 15°; now the sine of 15° is .2598 × 2 = .5176 × 4 (radius of pinion) = 2.0706: which is the true chordial pitch? Is this correct, if not, please correct it in your next issue. A. Yes, you are nearly correct in *result,* but in your formula you multiplied by 4, but placed a 6 instead. You take a long way round to obtain the result. It is simplified thus: $\frac{180°}{12}$ = 15° sine 15° is .25882. .25882 × 8 = 2.07056 pitch as required.

(4) H. N., Brooklyn, N. Y., writes: Suppose I have a propeller having 20 feet pitch, and making 70 revolutions per minute, which propels the vessel at the rate of 12 knots an hour, what is the slip, the sea-knot containing 6,082 2-3 feet?

A. 20×70×60=84,000 speed of propeller in feet.
6,082 2-3×12=72,992 speed of vessel per hour.
84,000-72,992=11,008 slip in feet.
84,000 : 11,008 :: 100 : 13.1slip in per cent. of the speed of the propeller.

(5) E. O. P., Alliance, O., asks: Why do the journal bearings on a locomotive engine-truck wear thinnest on the front side, as they invariably do? A. The effect is produced through imperfect lubrication. To illustrate: the journal derives its lubrication from the waste saturated with oil placed in the cellar. As the axle rotates, the oil is taken up on the back side of the journal, consequently, the point where the edge of the bearings touches the axle on the front side receives the least lubrication, as the oil has to be carried across the face of the journal to reach that point.

(6) J. S., Memphis, Tenn., writes: Is the steam-jacket on the cylinder of a stationary engine of any practical value? A. Yes; the 14,000 horse-power Corliss engine, at the late Centennial Exhibition, had both cylinders steam-jacketed and covered with hair-felting and bagging. It was, doubtless, owing largely to this fact that this engine worked with such extraordinary economy.

(7) B. T. N., Pittsburgh, Pa., writes: We have two or three locomotives that are inclined to cut their guides in running backwards, and particularly in wet weather. What is the cause? A. If the guides are in line, the cutting is often caused by the cross-head, owing to the angularity of the connecting-rod bearing against the bottom guides continually in running backwards, whether using steam or not. The ends of the cross-head, being worn square, will scrape the oil off the guides, especially when mixed with rain-water. When the engine is running ahead, and using steam, the cross-head rises and bears against the top guides, and only drops at each end of the stroke by its own weight. It is apparent that under these circumstances the lubrication becomes more perfect and there is less liability of cutting.

(8) W. E. H., Albany, N. Y., writes; I have a boiler in which the tubes are a source of much trouble from the fact that they are pitted in places, and, in some cases, these little pits extend completely through the iron. The iron in these spots is very black and soft and can be easily cut with a knife. What is the reason of this? A. If the water contains no corrosive matter, the main cause, doubtless, comes from a cinder in the iron, for some tubes, during the process of welding get little pieces of carbon accidentally worked into them, which, when the water reaches them, become very destructive to the iron and very soon cause holes.

(9) H. S. D., Burlington, Iowa, writes: In shutting the throttle valve of our stationary engine, I notice a clicking noise apparently in the cylinder which continues until the engine has nearly stopped. What causes this noise? A. When you shut the throttle, the motion of the piston produces a partial vacuum alternately on each end of the cylinder and in the effort to equalize itself, the slide valve is lifted and dropped upon the seat with every stroke of the piston thereby causing the mysterious sound.

(10) R. W., Norwich, Conn., asks: Can you give me any information about when files were first used? A. Bible. 1st Samuel, 13th Chap. 21st verse: "Yet they had a file for the mattocks, and for the coulters, and for the forks, and for the axes, and to sharpen the goads." This is the earliest use of files on record.

(11) N. E. J., Buffalo, N. Y., enquires: Are wrought iron tires a recent invention? (For car wheels) A. We believe that Mr. Rogers of Paterson, N. J., was the first to make and use wrought iron tires for car wheels in this country, in 1832, and experienced great difficulty in his experiments, but finally succeeded.

(12) R. O., Cincinnati, writes: How are files annealed for cutting? A. This is usually done by piling them in large quantities in an oven, and subjecting them to a slow fire until they obtain a cherry red heat, after which the oven is closely sealed or cemented, and the blanks allowed to cool. If this operation is properly performed the blanks will be found of a uniform softness.

(13) P. W. F., Jersey City, writes: We have a boiler with a small crack in the shell about three inches in length. What is the best way to repair it? A. Drill three or four small holes along the crack and insert rivets, hammering the heads well down to cover the crack.

(14) A. H., Erie, Pa., says: I have some bars of steel which I wish to test. What is the most simple way to do it? A. Break the bars at random and make some tools of the steel, and try them in the most severe manner.

(15) W. S. H., Croton Falls, N. Y., asks: Will you be kind enough to inform me, through your valuable paper, how I can temper taps and other small articles of steel, and have them come out white and clean? I have used soft-soap and salt, but it does not work well in all cases. A. We believe that the best way to temper taps and small articles is to use for the cooling solution the best sperm oil. If the oil is inferior in quality, the article tempered will be hard and soft in spots, and by using oil for tempering, the article comes out white and clean; the outside will be very hard while the inside will be soft. This process is used largely in tempering tools for boring gun-barrels. You will, of course, understand that the article must afterwards be cleaned, and then the temper drawn to the required hardness. It will require some practice to become proficient in this process.

(16) C. F. H., Lynn, Mass., says: Will you please tell me, through the columns of your paper how I can spread bee's-wax *very thin* on a smooth surface, such as steel tools? I have tried by melting wax and warming tools, but cannot get it thin enough. My object is for marking tools. The wax will drag after the scratch-awl and fill up the letters. A. We judge, from your description, that you began to mark your device before the wax was cold. A scratch-awl cannot be used. It is not absolutely necessary to get the wax a certain thinness to mark with acids, as we believe you intend to do. By a little practice, the following directions will work nicely for etching upon steel: Warm the steel and apply a thin coat (it does not matter about its being so very thin, as you suppose) of white wax, and let it thoroughly cool, then take a sharp engraver, and run the point through the hair, in order that the point may be coated with the least possible amount of grease, and mark the device through the wax. Apply nitric acid and allow to stand for a few minutes, then wash off thoroughly with water, and heat the article; rub off the wax with a clean rag.

(17) C. F. S., Petersburgh, Va. says: Please tell me how to make black Japan, and how to Japan and ornament sewing machines? A. 1. Japan black and flexible. Take burnt umber, 4oz.; Asphaltum 2oz.; Boiled oil 2qts. Dissolve the Asphaltum first in a little oil, using moderate heat; then add the Umber (ground in oil) and lastly the rest of the oil, and incorporate thoroughly. Thin with turpentine. 2. The castings should be thoroughly smoothed with a file, and the depressions filled with a hard drying putty, then apply a coat of Japan, and when thoroughly dry, apply another coat, being careful to put it on even. If the ornamenting is done with gold leaf, the figure is first marked out with a camel-hair pencil using boiled oil, and when the oil is almost dry apply the gold leaf and it will stick fast. Before applying the oil, a little whiting should be applied with a piece of Canton flannel to prevent the gold leaf from sticking to the Japan.

To Turn a Shaft Properly.

BY J. J. GRANT.

In the October issue of the AMERICAN MACHINIST I described the proper method of preparing a shaft for turning; the next thing is to see that we have the proper tools and appliances for so doing.

Any good lathe of sufficient length will answer our purpose, but it is necessary, in order to accomplish a large amount of work, to construct a special fixture or rest to be bolted to the sliding carriage.

The rest should be heavy and strong, and bolted to the right hand side of the carriage, having a cylindrical aperture, at least one inch larger than the largest shaft necessary to turn, and on a line with the centers; this should be dowelled on to the carriage to allow it to be put on again after removing in exactly the same position, and should also be bored out with a bar when in its place.

Rings of either cast iron or hardened steel having a hole of $\frac{1}{100}$ inch larger diameter than the shaft to be turned are fitted to the rest and held in place by a set-screw; the ring of this diameter is calculated for using a "doctor," or scraping tool at the rear end, and is bored out $\frac{1}{100}$ in. larger, to allow the doctor to take a finishing chip; when a doctor is used at the front end only, the ring should be of the exact size of the finished shaft.

At both ends of the rest a place should be planed in about 1 inch wide and $\frac{3}{8}$ inch deep at an angle of 45° from the horizontal line drawn through the center of the rest and on the front side, to receive the "doctors" or scraping tools; these tools may have a slot in them, and be held in with a collar-head screw. Lugs cast on the rest, and standing out over the doctors, have set-screws tapped into them to back up and set them down to their work.

There should also be two diamond point turning tools, one in front for removing the greater part of the stock, and the other for a light chip, and to take any that may be left from the first tool becoming dull. A good plan is to turn one end of the shaft the exact size for about six inches in length without the rest, as it facilitates the setting of tools, and when a large number of shafts are to be turned of the same size, one setting of the doctors is all that is necessary.

Having the rest properly constructed, and the shaft having been turned for a short distance on the end, place the shaft in the lathe, properly dogged, and while it is revolving, adjust the doctor at the front end to slightly scrape the finished part of the shaft. Care must be taken not to get the shaft too small in the ring, as it will not turn round, and the doctor at the rear end will chatter. Adjust the diamond point tools to take a thin chip and start the feed; have a ring or templet the size of the finished shaft, and as soon as the shaft comes through the ring, adjust the doctor at the rear end to cut to exactly the finished size, as shafting turned in this way requires no filing, and will come out very accurate and smooth. All the tools should be thoroughly lubricated with soda water, and occasionally a little oil applied to the ring. Care must be taken not to let the shaft become too large for the ring, as it will heat and stick.

With the proper tools and a rest, constructed as described, from 100 to 150 feet of 2-inch shafting can be turned in a day of ten hours.

After the shaft is turned it will be found to be sprung, and will have to be re-straightened, which can generally be done easily with a bar and a rest for a fulcrum; sometimes, however, it will be found necessary to jean it, which should be done by laying a thin piece of brass over the shaft and using a medium heavy hand-hammer, and giving it a smart blow, at the same time having a helper spring the shaft up with the bar. Your shaft is now ready to polish, which should be done either with nicely-fitted wood or lead clamps made with a hinge at one end, like a butcher's scrap-squeezer; never saw a V notch in them, as I have often seen done, but fit them around the shaft nicely. Use emery and plenty of oil or strong soap-suds, or soft-soap, and the shaft is done.

When it is necessary to turn a shaft in a lathe which has no follower-rest constructed as described, a center or steady rest (sometimes erroneously called a back-rest), may be used. In conjunction with the center rest a fixture called a "cat-head," made in the following manner is used. Take a cylindrical casting about 8 inches long, 4 inches in diameter, with a hole $2\frac{1}{4}$ inches diameter through it. At each end put three set-screws long enough to reach within $\frac{1}{2}$ an inch of the center, and you have a cat-head suitable for a 2-inch shaft, and smaller.

This fixture should be put upon the shaft, enough out of the middle to allow the shaft to be turned far enough, so that when the shaft is reversed end for end, the finished part will run in the rest. By so doing, the rest can remain in the same position until the shaft is finished and the cat-head can be removed, allowing the finished shaft to run in the jaws of the center rest.

The cat-head must be adjusted to run perfectly true, and the rest put in position, and the jaws brought to bear uniformly around it. Only one diamond point tool can be used when a shaft is turned in this manner, and it is generally necessary to run over the shaft twice; the first time should take most of the stock, and the next chip should be taken with a tool a little flat on the end, and set to drag after the manner of a scraping-tool. It will be found that the shaft is sprung after turning, and must be made straight again before the other half is turned or an offset will be formed. Turn the shaft as near as possible to the size required, as the less filing done to any shaft or spindle the better.

Use a float or mill-saw file, and use a ring or templet to file to; after the filing, be sure the shaft is straight. Polish with the same kind of clamps as before. Twenty or twenty-five of 2-inch shafting turned and finished in this manner is a good day's work. In all cases look well to your centers, and keep them well oiled. If the centers wear out of tone you can never make a satisfactory job, and always remember, quality before quantity, for you can never turn out a poor job, but sometime or other it will, like a bad penny, return.

Repairing Boilers.

It is commonly noticed in boilers that have seams of rivets exposed to the action of the fire, that after being at work for some time, cracks begin to appear, running from the rivets towards the center of the plate. The cause is, that one lap being covered by another prevents the water from getting to the one nearest the fire; consequently the lap nearest the fire becomes hotter, and expands to a much greater extent than any other part of the plate, and its constant unequal expansion and contraction, as the boiler becomes alternately hot and cold, inevitably results in a crack. These cracks may be temporarily repaired by drilling a hole in the bottom or extremity of them, so that the crack is completely drilled out; and, as a rule, this may be safely done if the crack is not more than 3 inches long, but if of greater length, do not tamper with it but have the plate out, if possible. If it is not practicable to take the plate out, cut out so large a piece that the seams of the patch shall be as far from the fire as possible. Let it be well borne in mind that, in addition to the two laps causing unequal expansion, the sediment or scale inside the boiler obstinately sticks in between the rivet-heads and under the edge of the lap from whence it is seldom or never properly removed in cleaning the boiler. After drilling out the end of the crack, countersink the drilled hole, and also the hole in the seam above it; so that when rivets are again put in, they will meet each other, or nearly so. Let the heads of these rivets be as thin as possible, so as not again to retain the heat, or attract or harbor dirt. Sometimes it will be observed that a crack in the seam is running from hole to hole between the rivets. This is always dangerous, and the cracked plate should be cut out and replaced by a new one as soon as possible. In putting patches on any part of a boiler, never cut a hole out with square corners, like the inside of a picture-frame; but cut the holes which are to be covered with a patch round, or as nearly circular as possible. But it is always better "not to put a patch on," but to cut out the defective plate and put in a new one, thus making the boiler as nearly as possible what it was when new. In putting a new plate in a very old boiler, it is advisable to have it a little thinner than the old plates were when new, say $\frac{1}{16}$th of an inch. In putting on a new plate, arrange it, if possible, so that the caulking shall be done on the new iron; but never place the edge of the laps towards the fire, unless a considerable distance from it.

Machinists' and Engineers' Supplies.

Trade does not show much change from last month. Novelties are difficult to introduce and very little effort is being expended in that direction. The near approach of the holidays renders business more quiet than it otherwise would be. There is not likely to be much extra stir until after January 1. The late closing of inland navigation has a favorable influence on trade, which, together with increasing orders for export, may be regarded as gratifying. Prices generally hold their own with a growing firmness.

The Billings & Spencer Co., of Hartford, Conn., have brought out a new Adjustable Tap and Reamer Wrench, in which the screw handle passes through the end of the stock and enters a hole in the end of a movable die, and a feather passes through the die and fastens it to the end of the screw-handle. Grooves are cut in each side of the movable die, and two screws pass through the sides of the stock opposite each other the points being well fitted to and entering the grooves in the die. The tool is drop-forged from steel, and is likely to become popular. The same company is also introducing Billings' Adjustable Pocket Wrench which is a neat little tool for machinists, amateurs, etc., and retails for 80 cents each.

A new foot-lathe for amateurs is just being manufactured and introduced by A. Alexander Pool & Co., 25 N. J. R. R. Ave., Newark, N. J.

BOILER MAKERS' SUPPLIES. Trade has been better for a few weeks past than it was in the summer months, but prices, which have been very low, do not appreciate. An increased demand for steam engines gives some boiler makers more business. We quote prices without change: Tank Iron @ 2¾; C, No. 1, @ 3; Shell @ 3¼; Best Flange @ 4¼; Soft Patch @ 6½; Boiler Rivets @ 3¼; Boiler Tubes list price less 40% discount. Mill prices furnished on application.

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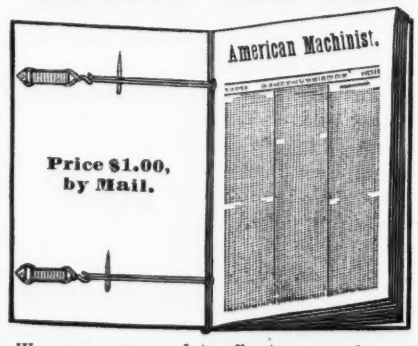

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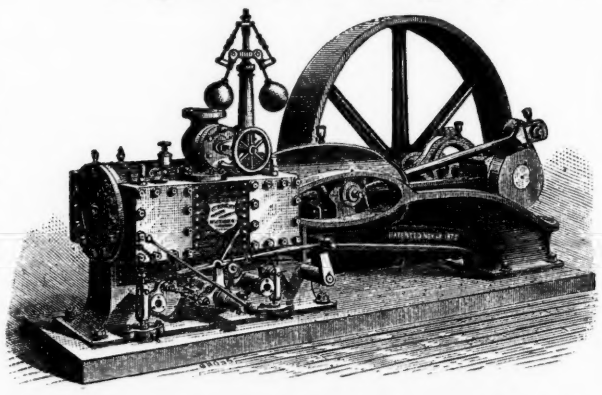

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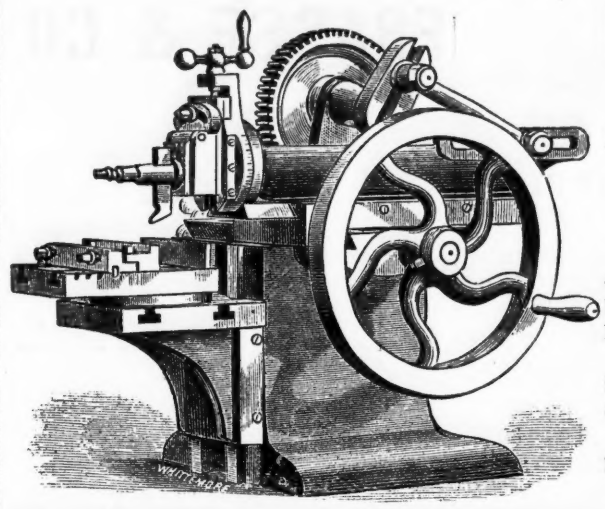

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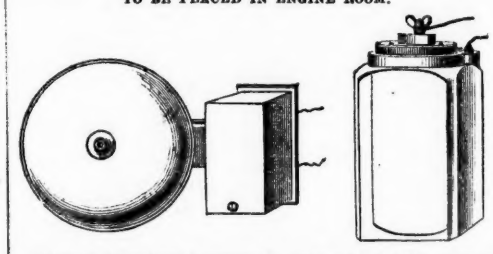

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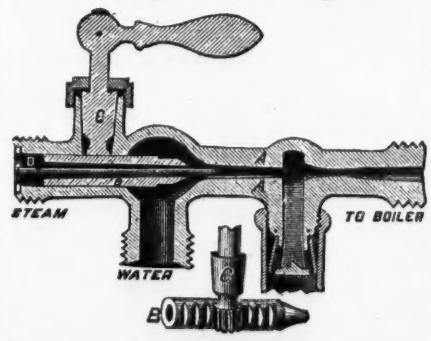

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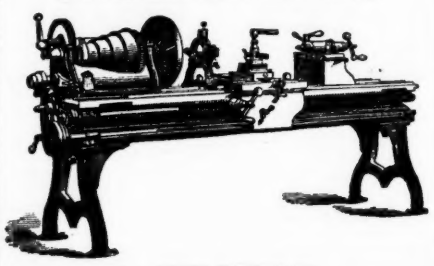

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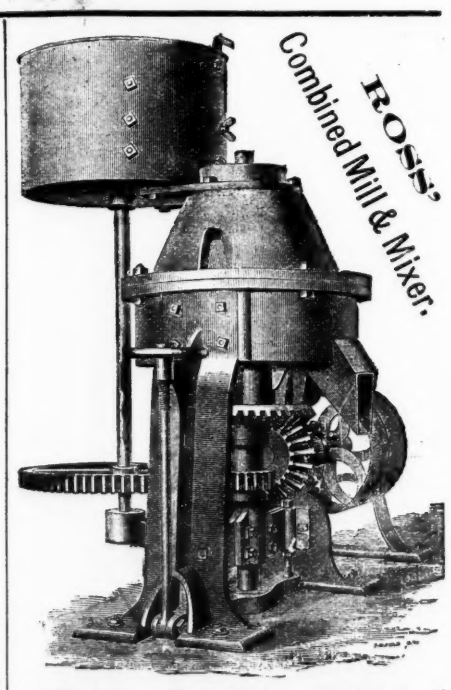

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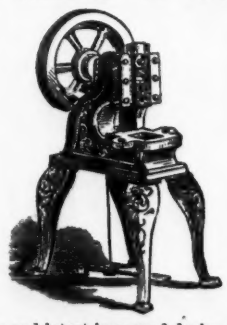

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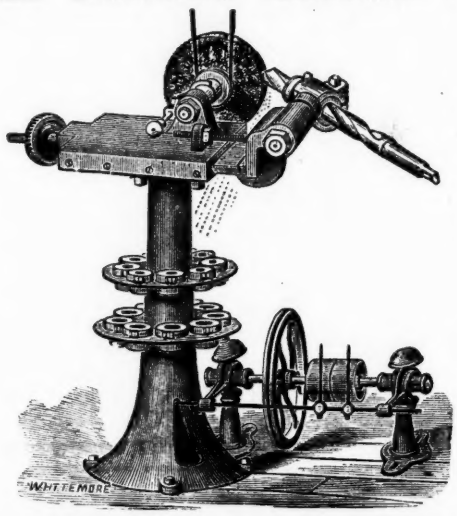

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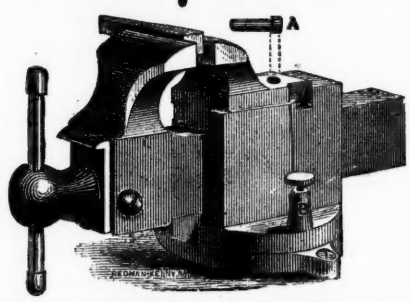

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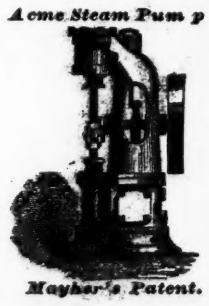

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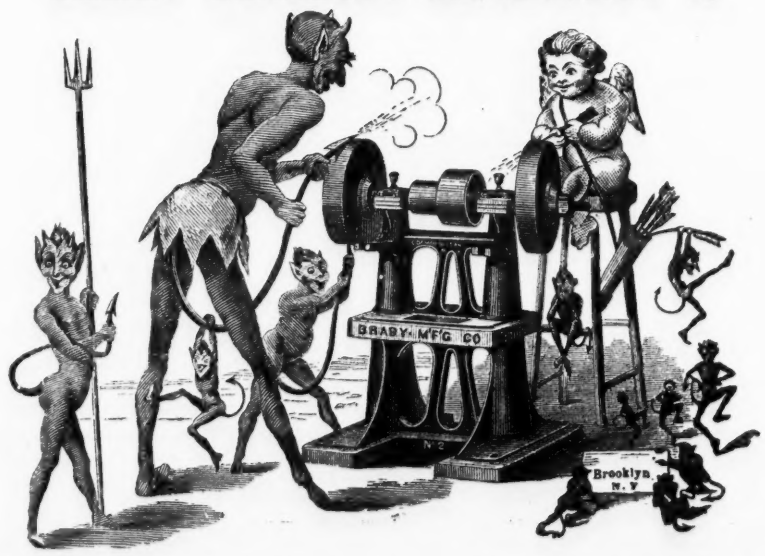

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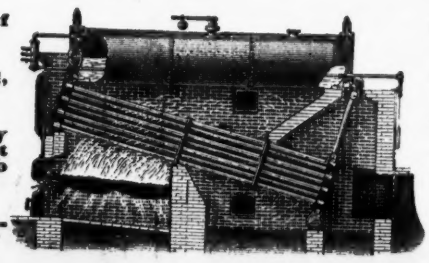

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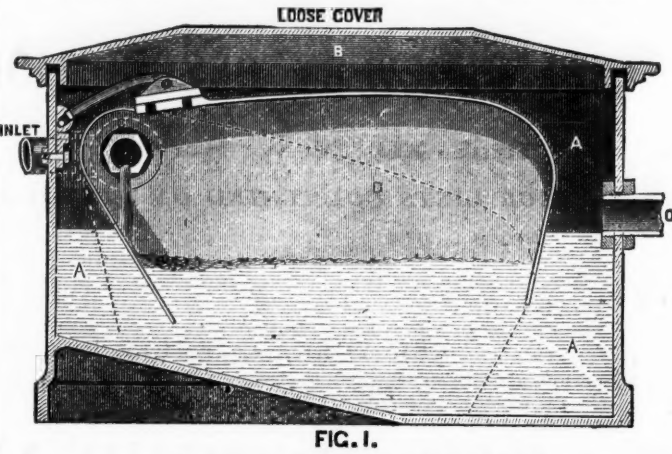

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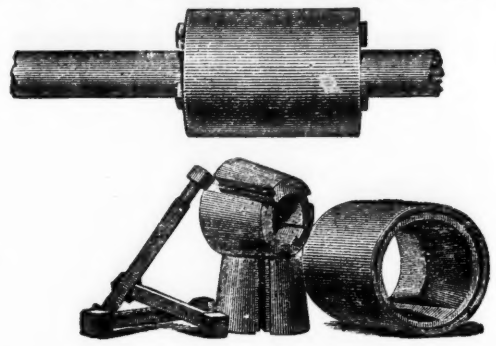

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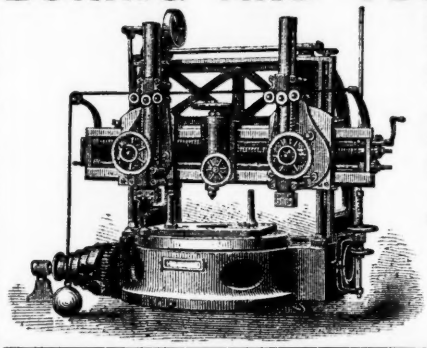

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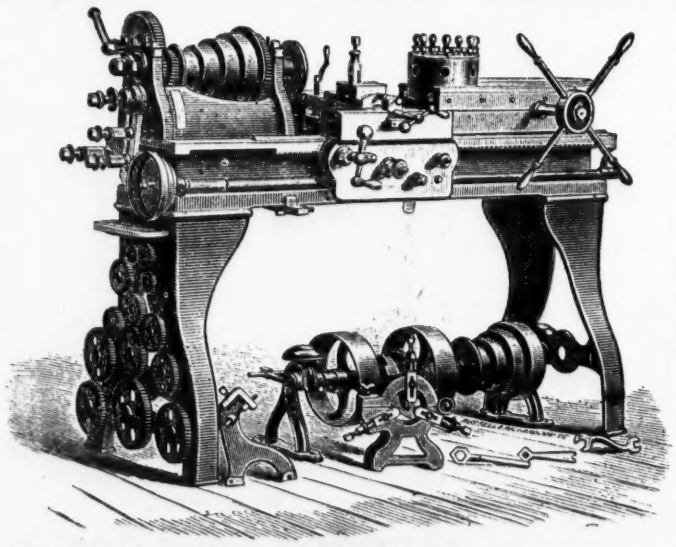

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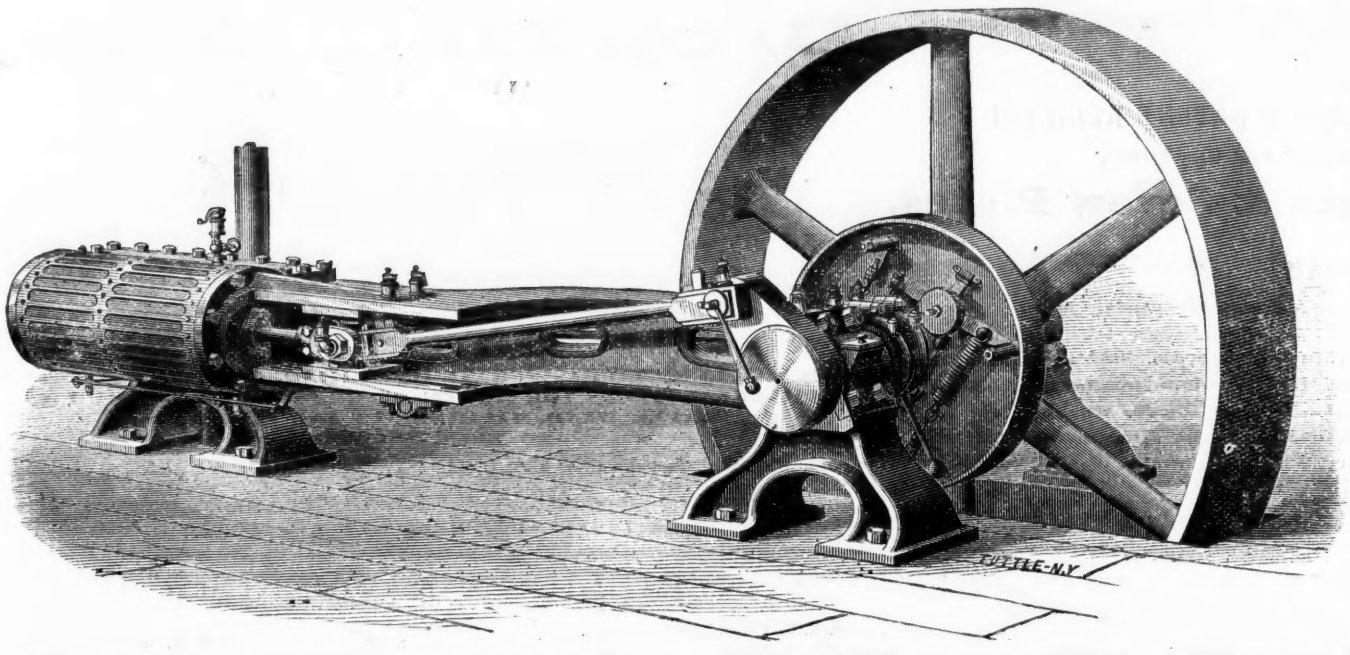

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One Engine Lathe, 21 in. swing 16 ft. bed
One Engine Lathe 24 in, swing 12 ft. bed.
One Engine Lathe, 28 in. swing 12 ft. bed,
Two Upright Drills, 27 in. swing, not geared.
One Upright Drill 22 in. swing, not geared.
One Upright Drill, 32 in. swing, back geared and self feed.
One Planer, 24 in. x 23 in. x 4 ft.
One Planer, 24 in. x 24 in. x 4 ft.
Two Planers, 32 in. x 30 in. x 8 ft.
One Planer, 32 in. x 30 in. x 10 ft.
One Planer, 37 in. x 37 in. x 10 ft.
One Planer, 42 in. x 36 in. x 15 ft.
One Planer, 72 in. x 66 in. x 24 ft.
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One Shaping Machine, 12 in. stroke.
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Two Engine Lathes, 16 in. swing, 8 ft. bed.
One Engine Lathe, 20 in. swing, 8 ft. bed.
One Engine Lathe, 20 in. swing, 20 ft. bed.
One Engine Lathe, 28 in. swing, 14 ft. bed.
Three Planers, 24 in. x 24 in x 4 ft.
Two Planers, 24 in. x 24 in. x 6 ft.
Two Upright Drills, 32 in. swing, back geared and self feed.
One Planer, 36 in. x 36 in. x 12 ft.
Two Shaping Machines 8 in. stroke.
Three shaping Machines, 11 in. stroke.
One Shaping Machine, 14 in. stroke.
One combined Shaping and Slotting Machine.
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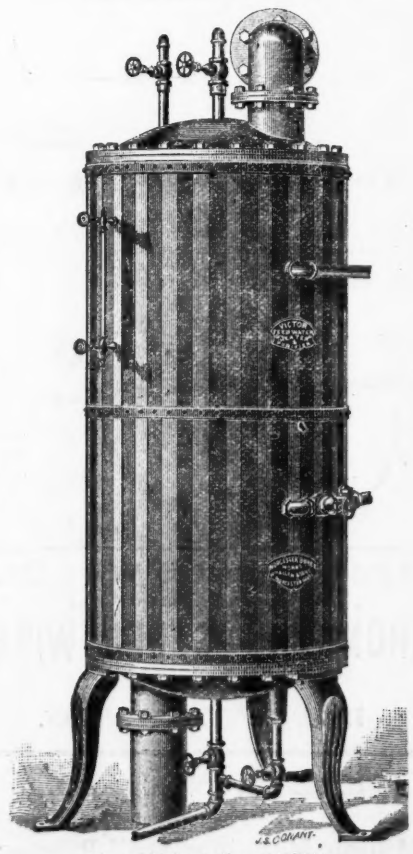

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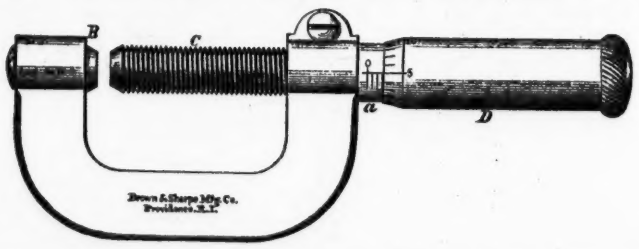

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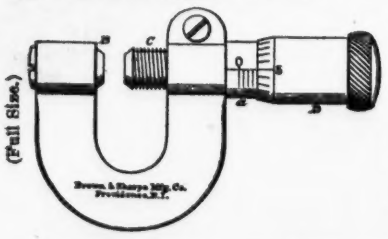

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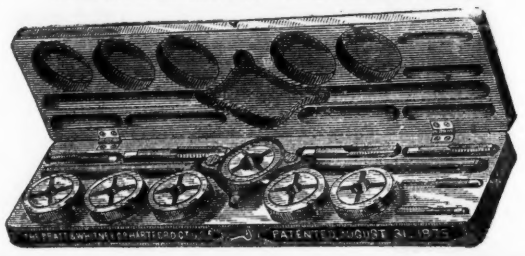

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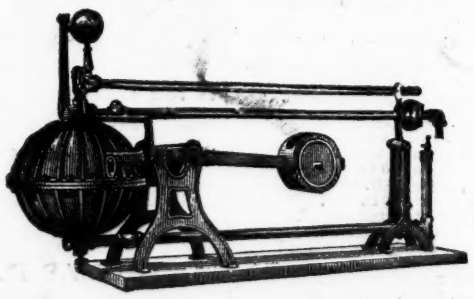

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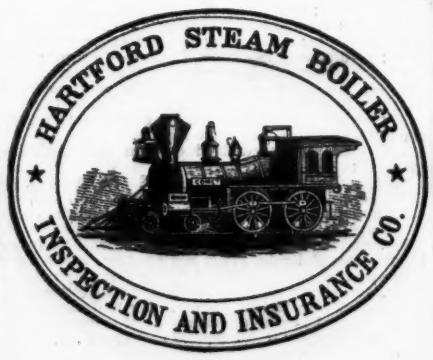

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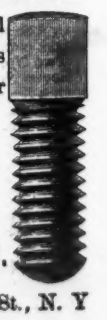

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